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TABLE OF LEADING ARTICLES.

Reinforced Concrete Factory Buildings	117
Engineering Handbooks	117
An Equitable View of Sewage Purification.....	118
City Refuse for Steam Raising	118
The New Spans of the Portage Viaduct, Erie Railroad. (Illustrated)	120
Time Required for the Construction of Large Public Works	121
The Water Filtration Works at Anderson, Ind. (Illustrated)	125
Combined Chemical and Bacterial Sewage Treatment, Withington, England	128
The New Works of the Fiberloid Company, at Springfield, Mass.—II. (Illustrated)	129
Cost-Keeping	132
The Revised Plans for the Purification of the Pittsburgh Water Supply. (Illustrated)	133
A Reinforced Concrete Machine Shop in Philadelphia. (Illustrated)	136
Specification Writing	138
The New Well and Hydraulic Pumping Plant at Peoria, Ill. (Illustrated)	139
The Turbine Power Station of the Terre Haute Traction & Light Co. (Illustrated)	141
A Test of an Air-Lift Pumping Plant.....	143
Tests of Steam Pipe Coverings.....	143
An Experimental Air-Pressure Gauge. (Illustrated)	143
A Special Problem in Reinforced Concrete. (Illustrated)	143
The Flow of Portland Cement. (Illustrated)....	144

Reinforced Concrete Factory Buildings.

Of all the fields into which reinforced concrete has won its way there is none which deserves more attention than that of mill architecture. At the present time, the so-called standard type of mill construction is an expensive luxury in some parts of the country for many industries. The price of suitable timber for the best wooden structures has risen steadily and by no means slowly, and even at high prices, it is not always possible to secure prompt deliveries. Species of wood are being brought East from the Pacific Coast which may serve as a substitute for those used for some purposes in the past, but it is safe to say that timber is fast becoming so valuable that, in comparison with other materials, it will gradually lose its present use in situations where it is required to carry heavy strains. Such strains can better

be cared for by members constructed of other materials.

The use of concrete has a marked advantage over all other building materials on account of the simplicity of its manipulation. Unskilled labor working under competent foremen can execute all ordinary works. This means freedom from delay and expense due to strikes, for it has not been found possible to organize unskilled labor into unions. The importance of this feature of concrete construction was well shown in the construction of the subway in New York, which could not have been opened when it was had not so much of it been concrete put in place by unskilled laborers.

Yet another advantage of concrete for mill construction is attained when it is reinforced. The old type of concrete floor arch was out of the question in most factories on account of its weight, which not only made the floors costly in themselves, but added materially to the expense of columns and walls, when the latter carried part of the floor loads. By the use of reinforced concrete, however, thin floors become possible and consequently their weight is materially reduced. Hence it is possible to put up a building which competes with the standard mill type in cost as well as in other important features. In the last few years a considerable number of such reinforced concrete shops and mill buildings have been described in The Engineering Record, and on page 136 of this issue still another, a Philadelphia machine shop, is illustrated.

This steady increase in the use of reinforced concrete for mill purposes in many sections of the country has not taken place without careful thought on the part of both engineers and their clients. To the latter the factor of cost for equal strength in both types is most important, and those interested in this subject will find an instructive discussion of it, written by Mr. George H. Maurice, in the "Cement Age" for January. This comparison is made between slow-burning mill construction with 12-in. walls and floorbeams on 8-ft. centers, and reinforced concrete construction with 6 to 8-in walls and a floor system about 11 per cent. stronger than that of wood. In a general way, the results of Mr. Maurice's investigation may be summed up as follows: For two-story or three-story factories in the New England States, measuring about 250x50 ft. in plan, of the usual type where no special requirements must be met, we may reasonably expect the reinforced concrete building to cost about 7 per cent. more than that of slow-burning construction, or about 2½ per cent. more if the latter has a floor stiffened with diagonal plank, as is now sometimes done. In the New York district, where the advantages of reinforced concrete are largest, the cost may be about 5 per cent. more, while in the Southern Atlantic States it may run up to 25 or 30 per cent. more than that of slow-burning construction.

This comparison relates only to the first cost of the building. There are two other features of this subject which ought to be considered. The first is the matter of insurance. The slow-burning construction was evolved by insurance experts and it will probably be some time before they will agree that anything else of the same cost is more resistant to fire. Nevertheless, it cannot well be disputed that reinforced concrete is less inflammable than wood and less likely to be injured by a fire in its vicinity. Hence the rate on a well-built structure of reinforced concrete may be expected to favor it before long, thereby offsetting somewhat its slightly greater cost.

Another factor to be considered in a building devoted to light manufacturing is freedom from vibration. While the average mill building is

amply strong for static loads it often shows by its sagging floors and shaking columns that the designer failed to consider the deflection as well as the strength of his main structural members. With reinforced concrete there will be little question about deflections and vibrations, for a system of construction designed with a factor of safety of five at the end of six months' hardening must necessarily be stiff under any ordinary jar due to the operation of machinery. This property of reinforced concrete is one of its most important minor advantages.

Engineering Hand-Books.

For the compilers of the leading engineering handbooks this journal has a deep respect, and in making the following suggestions concerning another handbook or manual of engineering data no reflection is intended upon the good work they have done or the thoroughness of the investigations on which the data in their books are based. The fact remains, however, that up to the present time there is in English no books which will take the place of the famous handbook of the Verein Huetten, although there is a distinct need of such a work.

Each handbook now enjoying any decided popularity is strong along certain lines, those most familiar to the author and his friends who contributed to the book. It is weak along other lines. The book that every engineer wishes to have on his desk is one having no weak spots. He does not require a reference book for the data of his specialty, but finds one useful when he wishes to secure the leading memoranda of some other branch of engineering. The book he wishes is not one that can be carried in his pocket, but one which, while as compact as possible, still furnishes reasonably comprehensive information. It is not one teaching him the primary rules of applied mechanics, taught in every respectable high school and academy in the country; it must be a real engineering handbook free from elementary slush. In short, the book must be one which recognizes the fact that the man using it is the graduate of a technical college and not a misguided being who believes that it affords an inexpensive substitute for a course in some good correspondence school.

It is manifest that such a handbook cannot be the product of a single man. It must be the work of many, carrying out their task of compilation and condensation of the data of their specialties under the direction of a central leader. It is also important to observe that in each specialty it will be necessary to have the work revised by several parties, because the comprehensive character necessary in such a book can only be secured by thoroughness in scope and accuracy in detail in the case of each subdivision. It may be thought that such a book and method of preparing it is an idle dream. The fact remains that the best engineering handbook and one of the most interesting societies are proof that the plan is possible. The Verein Huetten is an enterprising Berlin organization of specialists in all branches of engineering which has a most enjoyable social side, or did a few years ago, and also brings out every few years a revised edition of its valuable pocket-book.

This German book, valuable as it is, is not suited for the use of American engineers, for it is the outgrowth of German educational methods and engineering practices. In many ways it would be a good model to follow, while in others departure from its system would be likely to be useful. In a general way, however, it may be stated that the co-operative production of such a manual would prove of distinct value to the engineers of the country. It would

of course not be lucrative to those engaging in it, for technical authorship is rarely productive of direct financial returns. On the other hand, the social features which a well-organized group of compilers would doubtless inaugurate as a part of their meetings might be expected to repay in a measure for the work put upon the book.

This suggestion is made because of criticisms made lately concerning existing handbooks. With the majority of these criticisms this journal has no sympathy, for the compilation of the manuals now available for the engineer represent much hard work well done by competent men. The trouble with the books is one of scope rather than of quality. Where it is necessary to have at hand three books of data, for civil, mechanical and electrical engineering, and a large part of the information in these three is identical, it is manifest that a single manual combining the three would be of advantage. It is also true that in some books of this class the number of pages devoted to very elementary information could be greatly reduced without any detriment to the quality of the volume. Moreover, there is a great need in such books of the many rules for rapid computation and for the approximate determination of dimensions of structures and machines, with which specialists are familiar, but no other members of the profession. These aspects of the engineering handbook problem suggest the feasibility of joint authorship of such a work and the strong probability that the latter would fill a useful purpose.

An Equitable View of Sewage Purification.

The Supreme Judicial Court of Massachusetts has recently rendered a decision in a suit brought against the city of Worcester, based on its alleged carelessness in purifying its sewage. The court's opinion, 72 N. E., Rep. 326, is particularly interesting because it upholds on judicial grounds the view occasionally expressed by eminent engineers, that it is often more satisfactory to permit a certain degree of pollution of a water course and filter the water for subsequent use, than to endeavor to prevent all contamination of it.

The city of Worcester has gone to great expense for the construction of the largest sewage treatment works in the United States. These are under the direction of a well-known sanitary specialist, who keeps in close touch with the world's progress in sewage disposal and carefully tests all new methods which seem applicable to the local conditions. Nobody familiar with the works and their management will admit for a moment that every reasonable precaution is not taken by the city, and for this reason any judicial opinion of a contrary character would be disheartening to all those who are working in this field. As a matter of fact, the court does not, in this case, make any statement on this subject, but contents itself with pointing out the fact that the treatment of the sewage of a large city is a sanitary measure beneficial to a larger population than that living in the city itself; on his account, it is stated, some assistance should be rendered the city by those who are benefited by its sanitary work. This was recognized by the Legislature in the act requiring Worcester to purify its sewage, for this act provides that the State may, if it seems desirable, distribute a part of the expense of purification among all the cities of the commonwealth.

This policy is explained at considerable length by the court. The construction of the sewage disposal works by the city may be considered as a governmental act which the authorities are ordered to perform by the Legis-

lature, or as a local affair which the municipality is permitted to carry out. Under the first assumption, the city cannot be held liable for small nuisances after it has taken all reasonable steps to purify the sewage; under the second assumption, it is liable for every unpleasant result, great or little, which is due to its sewage disposal system. The court decides that the former view is the correct one. The purification of the sewage before its discharge into the Blackstone River is held to be a measure in the interests of the general public, looking particularly to the protection of the health of the people living near that stream. Such a requirement is like the obligation to provide education for children or that to maintain the ordinary institutions of government. "It requires the removal of sewage, not so completely as to make the water pure for all kinds of manufacturing purposes, but only to such a degree that it shall not create a nuisance or injure public health."

This view of the subject is such a broad one that it is questionable how it would be applied in the case of a city which showed less liberality and energy in its endeavor to fulfil the obligations put upon it. Worcester is trying successfully to purify its sewage in a manner free from offense to owners of neighboring property and so efficiently that the effluent will be without injurious effect on the river that receives it. The claims that it is not doing so seem unfounded. The only one that apparently deserves attention is the assertion that the river is so foul in summer as to be extremely offensive. This condition is due, however, to the sludge that has accumulated for half a century in the many millponds along the stream. During the low water of summer these sludge beds would give off a stench even though the stream ran eau de cologne instead of the drainage from a densely populated catchment area. The city is doing all in its power to live up to its obligations, and it is gratifying to observe the recognition of its policy by the court of final jurisdiction in the commonwealth.

City Refuse for Steam Raising.

The city of New York will shortly undertake an experiment deserving particular attention from municipal engineers in the United States. It will attempt to run a crematory in connection with an electric lighting plant, a task which may not seem at all serious to some British readers, yet is full of uncertainty here. For some reason or other it has been impracticable as yet to repeat outside of Great Britain the good results obtained there with combined destructor and electric plants. In Hamburg this has been done, it is true, but in Berlin the outcome was in question at the time this journal received its last information, not many months ago. In America it is still an open question whether the proper type of crematory has been designed for the character of refuse that must be destroyed. In fact, it may safely be stated that a number of types must be designed, because that which will be satisfactory where mixed garbage, ashes and miscellaneous refuse must be destroyed is manifestly unlikely to be adapted for burning the sorted miscellaneous refuse which will be used for a fuel in the plant to be built in New York. This was pointed out at the International Engineering Congress last fall by Mr. Rudolph Hering, who specifically referred to the unsatisfactory showing in some respects made by English types of furnaces in Montreal and San Francisco.

The first test of this sort which will be made in New York will be on a comparatively small scale, which is fortunate. The opportunities

for failure are so many that it is well to be modest about the experimental plant. It is true that the Street Cleaning Department has made some previous trials with sorted refuse as fuel and has reached results which are most satisfactory to the head of the Department, although others may regard them differently. It is a fact that the Department has no proof that it can deliver to the proposed electric station any kind of refuse material which can be burned under a boiler with sufficient efficiency to furnish steam to run a 100-h.p. engine steadily; on the other hand, it is not at all improbable that by using specially designed furnaces and boilers that enough refuse can be delivered to the plant to furnish steam a part of the time, at least, leaving the plant dependent on coal for but a portion of the day.

This consideration brings up the crucial point of the subject of refuse destruction in connection with power production. This is the absolute necessity of separating the functions of such a station into the sanitary disposal of refuse and the economic production of steam. The refuse must be consumed in a proper manner, and the furnaces must be arranged to do this with certainty. If they can be also arranged to furnish heat to a boiler plant, so much the better, although the sanitary disposal of the material must not be sacrificed in so doing. On the other hand, the generation of steam should be attended with the minimum of expense consistent with the satisfactory running of the engines. It is by no means certain at the present time that New York refuse is of a character fitting it for use in raising steam for boiler purposes, and it may be better to use the heat from the crematory for some other purposes than raising high-pressure steam. These reflections must not be considered an indication of the belief of this journal that the proposed station should not be constructed; on the contrary, the project deserves the warmest support, as it will furnish valuable data to the city's officials and may result in a considerable saving in the cost of lighting and refuse disposal.

This view of the subject is strengthened by a valuable paper read before the Institution of Electrical Engineers of Great Britain a little while ago by Mr. W. P. Adams, on the combination of dust destructors and electricity works economically considered. He analyzed the returns from many plants in a skilful manner and reached conclusions which are far from being enthusiastic regarding refuse as fuel. He shows that it is necessary to employ special construction for some parts of the plant, or the efficiency of the combined plant will be seriously cut down, and that the plant must be designed with a fair knowledge of the character of the refuse to be burned throughout the year. Unless the plant is planned with a full understanding of these special features, it may fail to dispose of the refuse satisfactorily and may be lacking in sufficient provision for raising steam with coal. As such information is not available in New York, this initial plant, where it can be obtained, will be of exceptional value.

Notes and Comments.

THE RIVETED STEEL CONDUIT acting as the main artery through which the water supply of New Bedford is pumped to that city is threatened with destruction by electrolysis. The conduit forms part of the return circuit of the Old Colony Street R. R. "It makes a beautiful conductor for them, but it is bad for us," Superintendent Coggeshall, of the water department, reports. He states further that he has called the company's attention to the importance of giving this matter prompt attention but has

failed to receive any satisfactory reply. This shows a lack of tact on the company's part hardly to be expected in Massachusetts, where experience has proved the importance of co-operation between railway companies and water-works officials to check this often serious destructive action. It hardly seems likely that the New Bedford conduit is in a dangerous condition now, but assuming that it should break and the city suffer a scarcity of water, it is idle to conjecture what this community of retired whalers would not do to the haughty railway.

THE CONTROL OF THE PANAMA CANAL is vested directly in the President by the terms of the bill reported on Jan. 31 by the House Committee on Interstate and Foreign Commerce. The exact wording is as follows: "That until the expiration of the Fifty-ninth Congress, unless other provision be sooner made by Congress, all the military, civil and judicial powers of the United States in said canal zone, including the power to make all rules and regulations necessary for the government of the canal zone, and all the rights, powers and authority granted by the terms of the treaty aforesaid to the United States, shall be vested in the President of the United States, and may be by him vested in such person or persons and shall be exercised in such manner as the President shall direct for the government of said canal zone, and maintaining and protecting the inhabitants thereof in the free enjoyment of their liberty, property and religion. The President is authorized, through one of the executive departments, to construct the canal; also to employ such persons as may be needed and fix their compensation." It seems probable that this bill or one much like it will be passed.

THE SPECIFIC HEAT OF SUPERHEATED STEAM is discussed at considerable length by Prof. Sidney A. Reeve in the "Journal" of the Worcester Polytechnic Institute. His investigations lead him to draw three conclusions: First, the specific heat increases very markedly with the temperature; second, there is a variation in the specific heat with the pressure; third, the specific heat at those pressures and temperatures which most commonly occur in steam-power engineering is undoubtedly much higher than the 0.48 or 0.50 which has been usually employed. Professor Reeve believes that it may easily be as high as 0.75 to 0.85; this means that superheaters have higher efficiencies and superheated-steam engines have lower efficiencies than those hitherto accorded to them. The main object of Professor Reeve's paper is to call attention to the need of research to furnish reliable information concerning this important property of steam. For this purpose he suggests the use of a small high-pressure boiler, adapted for 500 lb. pressure if possible, and a mercury column about 90 ft. high. The minor apparatus would be a gas-flame superheater, a simple orifice for the wire-drawing, and a continuous calorimeter beyond, with a second mercury column for the secondary chamber. It is to be hoped that some public-spirited boiler or engine makers will see the importance of such tests and assist Professor Reeves to make them.

THE CONTROL OF STREET RAILWAYS by steam roads in the same territory is commented upon favorably in the last annual report of the Massachusetts Railroad Commission. It says that the usefulness of the street railway in bringing people to the steam railroad from the different sections of the cities and towns which it serves and in distributing them again at the end of the railroad journey will be generally recognized. Even where these railways have been interurban in character and to some ex-

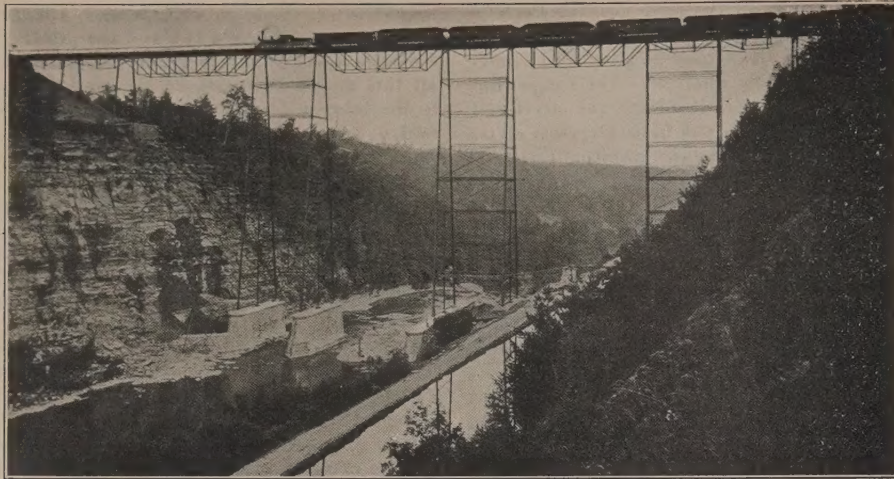
tent competitors of the railroads, the Commission doubts if the passing of control into the hands of their rivals need be attended by detriment to the public interests. The competition between the steam railroad and the street railway must eventually end in each system giving to the public the service which it is best capable of performing, and it is by no means clear that in order to bring this about in the wisest way it is at all essential that the competitive conflict between these companies be prolonged. The two systems ought to work together advantageously under one administration, subject, as they would be, to the supervision enforced under the Massachusetts statutes, changes in service upon one or the other being made only in furtherance of a greater comfort and convenience in travel. These views may be in line with the best public policy in a State where the laws and the railroad commission are equal to those in Massachusetts, but their applicability elsewhere is open to question.

FIRE IN A TUNNEL during its construction is rather unusual, and for this reason it may be of interest to mention a recent incident in the heading of the north tube of the tunnel being driven under the East River between the lower end of Manhattan and Brooklyn. During the night of Jan. 29 a fire was started in this tube at a point about 1,500 ft. from the Battery Park shaft and about 65 ft. below the high-water level, where the air pressure is about 23 lb. There are two air locks in this tube, the second being about 500 ft. from the heading. As soon as fire was discovered water was forced into the heading through a 6-in. pipe to flood it, care being taken to maintain full air pressure so as to prevent any danger of collapse. The heading was filled in about 48 hours and the fire extinguished in this way, after which the water was pumped out again. The fire was confined entirely to the blocking above the timber sets, and as it did not injure the roof arches no material damage was done beyond the interruption of the work. The chief engineer made an inspection as soon as the water was pumped down enough, and found the tunnel in good condition. The origin of the fire is supposed to have been a workman's candle carelessly left lighted among the blocking. The timbering is massive and would not ordinarily take fire readily from a small flame, but combustion is so greatly accelerated under the heavy pneumatic pressure that a candle flame, when extinguished, immediately relights itself. There is 20 ft. or more of earth and rock between the north and south tubes, and the smoke penetrated this material so as to be perceptible for the south heading.

A RUDE SHOCK has been administered to the hard-working people of the country by evil intelligence from Carlisle, Pa. It is nothing less than a capitalistic attempt to corner another necessity of life, not by direct control of the supply, but by laying avaricious hands on the transportation facilities by which it is delivered most economically to the leading markets. For some time the public mind has been disordered by stories of frenzied finance, until it is in a state of doubt, not as to its understanding of the stories afloat concerning corporation greed and crookedness, but it frankly does not understand them, but whether anybody concerned in the writing or publishing of the tales has any definite idea of their purpose. But everybody knows that he is not getting as much money as he is earning, while the other fellow works but a few hours a week and is able to found universities and give mouldy clothing back to the foreign government from whom it was stolen years ago. And so, when people high

in authority combine with money changers from the Massachusetts hub and the protégé of a distinguished publisher to tell the public that all this money that gets by the working man to the octopus does so by virtue of the latter's control of transportation, a feeling has naturally grown up that it was high time to fix the railroads. It is also recalled that by those who study finance in the pages of the magazines, that the control of the oil business was not secured by an eminent philanthropist until he had the pipe lines bought up. The security of his subsequent position is evinced by the fact that when it is desired to say a man has a peculiarly secure grasp of anything he is sometimes stated to have a "pipe line cinch" on it. And now comes the news that a syndicate is to construct a pipe line for milk, thereby obtaining a fatal grasp of this necessity through controlling the cheapest method of delivering it to the large cities from the dairying districts. The financiers of Carlisle should beware how they goad the public; it may remain humble when its kerosene goes up a cent, but if its baby's milk supply is cut off, the rumbling will become open revolt, which not even the friendship of Mark Twain or donations to our great universities will quiet.

A NEW INCANDESCENT LAMP that Siemens & Halske have brought out in Germany is an interesting result of important research conducted by that company. The visible radiation from the filament of an incandescent lamp increases with its temperature, so some years ago the company gave Dr. W. von Bolton the task of discovering a material that would withstand a much higher temperature than the usual filament can endure. After experimenting without success with vanadium and niobium, both of which have melting points too low for the purpose, he found in tantalum the desired metal. The pure metal was found to resist all acids but hydrofluoric, and to have a tensile strength when drawn into wire of about 133,000 lb. The development of a commercial lamp from the data of Dr. Bolton's experiments was in charge of Dr. O. Feuerlein, whose first lamp that was at all successful was completed two years ago. Further experiment showed that the commercial problem was to mount a filament about 2 ft. long within a glass globe which did not exceed the dimensions of an incandescent lamp. The history of this part of the new lamp is an interesting one and has resulted in the use of a piece of glass like the bit of wood on which thread is spooled. The ends of this glass carry about a dozen little ribs like those of an umbrella, and on hooks on their ends the tantalum wire is wound up and down so as to form a skeleton cylindrical surface. A considerable number of lamps made in this way have been packed in the usual manner and shipped across the sea and back in order to discover their resistance to transport; they came back unhurt. Numerous trials for long periods at loads of 1.2 to 3.4 watts per candle power are stated to have shown that the tantalum lamp uses only half as much current at the same voltage with the same intensity of light and the same useful life as a carbon filament lamp. After burning 200 to 300 hours the tantalum wire loses a great deal of its mechanical resistance. It is therefore advisable, when such lamps have served for some time, not to remove them from their old fittings and put them into others, as this may break the filament. Whether the lamp will be a commercial success can be determined only by the test of experience, but the scientific research that showed the utility of tantalum and the experimental work that has produced a lamp for commercial use are characteristic of engineering work of the best type.



First Iron Viaduct, Built in 1875.

THE NEW SPANS OF THE PORTAGE VIADUCT, ERIE R. R.

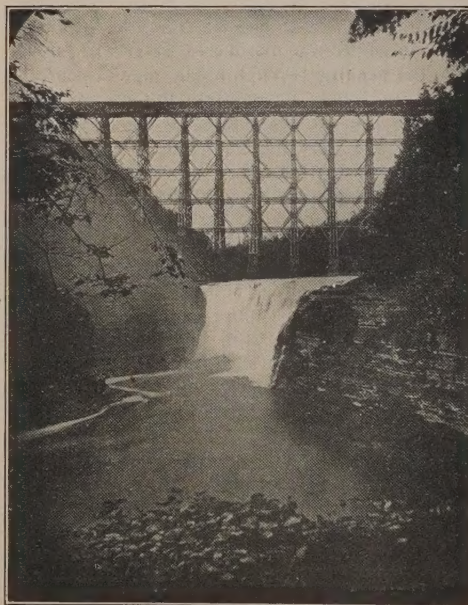
DESCRIPTION OF THE THIRD BRIDGE BEARING THIS NAME.

The Portage viaduct, which for many years was famous as one of the highest railroad bridges in the world, is a single-track structure officially known as Bridge No. 16 of the Buffalo Division of the Erie Railroad. It consists of a series of spans connecting towers seated on low-masonry piers built on solid rock in a deep gorge with precipitous sides. It has a total length of 819 ft. between back walls and a height of 235 ft. 2 in. from the bed of the stream to the base of rail. The original structure was a timber trestle built in 1852, and replaced in 1875 by a light wrought-iron structure with pin-connected members, designed by the late G. S. Morison, then bridge engineer for the Erie Railroad. It contained about 639 tons of iron manufactured and erected by the Watson Bridge Co.

As the traffic of the road increased in weight and volume and the iron spans became inadequate, plans were made for replacing them with heavy riveted trusses and plate-girder spans for increasing traffic at a higher speed. They are proportioned for a train load of 4,000 lb. per lin. ft., preceded by two coupled 123½-ton locomotives with 53-ft. wheel bases and 35,000 lb. on each of four pairs of drivers on 4½ ft. centers. This train loading is nominally rather light in comparison with that adopted by some other important roads, but it is compensated for by the low unit stresses allowed, which result in the use of sectional areas about as heavy as are found in any corresponding structure. The train load is considered to be, in reality, a matter of little consequence, since the longest span on the Erie system is only 223 ft., and is therefore nearly covered by the locomotives. There are bridges and viaducts of total lengths up to more than 2,000 ft., but they are all made up of spans shorter than that above mentioned, so that their severest stresses are caused by the locomotives. Longitudinal stresses are assumed at 2 per cent. of the maximum live load, and the wind pressure is assumed at 600 lb. per linear foot.

The old towers and foundations were carefully inspected and found to be in good condition, and as the former structure had been intended ultimately to carry two tracks, the substructure was considered adequate for the increased dead and live loads of a single track. All of the towers and masonry except one abutment were, therefore, retained, and the reconstruction consisted in the replacement of the old track, floor system, girders and trusses by new spans supported on the old towers. The old girders and trusses were seated directly on the caps of the tower columns and were spaced 19

ft. 10 in. apart on centers. The track was carried on 8x16-in. cross-ties 22 ft. long and 14 in. apart on centers which rested directly on the top flanges of the old girders and the top chords of the old trusses. The new structure was designed entirely to facilitate its substitution for



Original Wooden Viaduct; 1852.

the old spans without interrupting the regular train service, and the width of the old span enabled the new one to be erected complete between them and be supported on new transverse girders without adding to the stresses in the old spans or throwing the latter out of service until the new were ready to receive the traffic.

The new trusses and girders are spaced 14 ft. apart on centers, thus clearing the tower columns, and are seated on the top flanges of heavy new transverse girders field-riveted to the inner faces of the columns several feet below their tops, some of which remain projecting above the upper flanges of the girders, while others are cut off even with the new girders.

The three truss spans are seated on special transverse girders 10 ft. deep made with solid web-plates at the end and open center panels X-braced with heavy diagonal members, as shown in the detail. Each end of the girder is seated on a kneebrace bracket with double webs.

The depth of the connection is calculated to afford sufficient stiffness to provide all necessary sway-bracing and compensate for the omission of diagonals in the upper panel of the tower. Each end of the girder is connected to the tower column by seventy-four ¾-in. field rivets at each end, exclusive of those in the brackets. The 50-ft. connecting girder spans are seated on solid-web transverse plate-girders 6 ft. deep, with similar double-web kneebrace brackets at both ends. These girders have forty-four ¾-in. field rivets at each end in the connections to the columns, and, like the other girders, have vertical web-stiffeners under the loaded points only. The arrangement of field rivets is such that all of them could be easily driven.

The 100 and the 118-ft. spans have pin-connected Pratt deck trusses, respectively 14 and 15 ft. deep on centers. The details are substantially alike, and each of them is designed to carry the track ties directly on the top chord. Both top and bottom chords are connected at panel points by horizontal transverse struts with I-shaped cross-sections built of pairs of angles back-to-back latticed. The lower struts have horizontal connection plates on the bottom flanges, which engage the feet of the vertical posts, and their end web tie-plates project above the top flange angles to form gussets field-riveted to the inner faces of the vertical posts. The upper struts have jaw-plates engaging the flanges of the chords. The upper jaw-plates in the top struts receive the pin connections for the clevis-ended, top-lateral diagonal rods. The lower-lateral struts clear the inner ends of the bottom-chord pins, and the latter are fitted with wing plates in vertical planes which receive the pin connections for the clevis-ended bottom lateral rods. At each panel the top and bottom struts are connected by pairs of X-brace angles riveted together back to back and engaging kneebrace plates between the struts and vertical posts. At the end of the span the lower strut is replaced by a pair of angles back-to-back, and a plate-girder is seated on bracket plates below the upper transverse strut. The top chords are each made in three lengths connected by two field-riveted splices with double-web plates field-riveted to both members and a single cover-plate shop-riveted to one member.

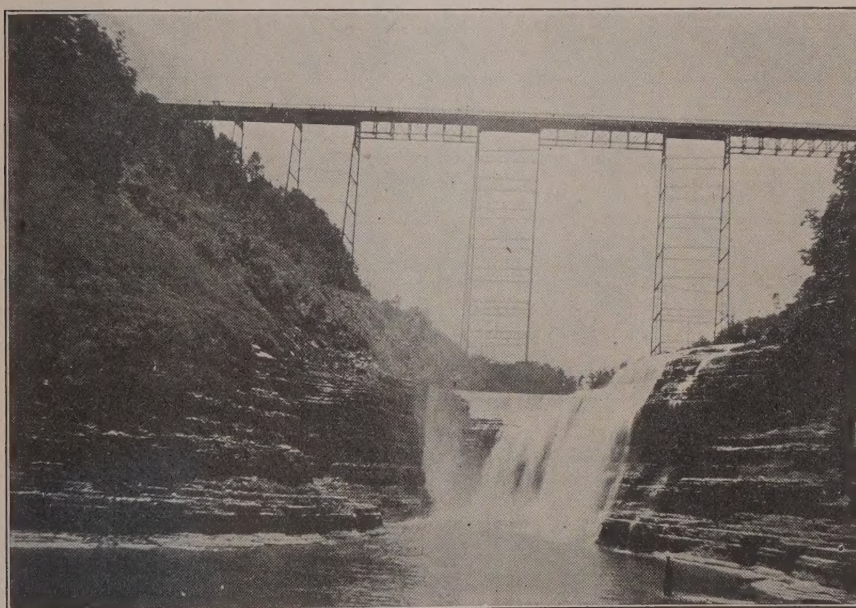
The details of the vertical end posts are special in order to provide for the requirements of erection, which made it necessary to assemble and swing the spans before they were connected to the end posts. These posts in reality served as auxiliary towers united by their transverse bracing, and providing supports for the jacks by which the trusses were lowered from their first positions to their final seat on the upper ends of the posts. On this account the posts do not engage the end top-chord pins, but have horizontal cap-plates on which the lower flanges of the top chords were eventually seated. The top chords are connected by end horizontal transverse struts like those at intermediate panels, and the end posts are connected by transverse sway-brace frames enabling them to act as independent bents before their connection with the trusses. The upper member of these sway-brace frames, instead of being an ordinary strut like the lower member, is a plate-girder which was required to provide support for the jacks by which the trusses were lowered to position after they had been swung and while they were under train service. The feet of the posts have horizontal base-plates and vertical inside web-plates shop-riveted to them and projecting some distance to receive the field-riveted connections to the end lower-chord sections, which are riveted members two panels long. At one end of each 100-ft. span, the connections to the lower chord are made with bolts in 3x1-in. slotted holes. This is considered necessary in order to

allow for temperature movements, because the vertical posts are rigidly attached to the fixed columns and no other adjustment is provided for the trusses.

The longitudinal girders, nominally 50 ft. long, vary in actual length back-to-back of angles from 48 ft. 4½ in. to 50 ft. 2½ in. They have a uniform depth of 6 ft. 0.4¼ in. back-to-back of angles, and the webs are made in four-sections with three field-riveted splices, each having 36 rivets in two vertical rows. The girders are braced at each splice by a vertical transverse frame with two panels of X-brace angles. The panels between these frames are X-braced with the top-lateral system of diagonal rods with screw ends, which pass through 4½-in. slotted holes in the web of the girder just below the top flange. Their nuts take bearing on bent plates riveted to the outsides of the girder webs.

Each girder is divided into panels of about 6 ft. by pairs of vertical web-stiffener angles and fillers. At the ends these angles in adjacent girders are field-riveted together through their outstanding flanges, so as to splice them rigidly and make them form continuous girders except at expansion points, where they are bolted in-

rectly supported the 50-ft. spans are cut off flush with the top flanges of the new transverse girders and capped with horizontal plates, field-riveted to the columns and the girders; these horizontal plates have projecting wings on each side bent downwards to receive the pin-connections for the longitudinal diagonal rods in the battered planes, which were cut down to the required length. At the ends of the truss spans the top chords of the latter are braced to the tops of the tower columns with short inclined struts. The columns are not cut off, but their tops are capped, as previously described, with bent plates that receive the riveted connections of these struts and of another set, which are field-riveted at the opposite end to the webs of the 50-ft. girders. Their points of connection to the girders are connected by horizontal transverse struts formed with pairs of heavy angles. This system of braces provides a balanced framework and transmits the longitudinal stresses from both truss and girder spans through the wing plates on the tops of the columns which engage the upper ends of the longitudinal diagonal brace rods, as already described. This system was designed after the superstructure had been built and has been found to give satisfactory results,



New Steel Spans on Old Iron Towers.

stead of riveted and have slotted holes for the lower flange connections to the cross girders. The ends of the girders adjacent to the trusses are similarly riveted to the end vertical posts of the trusses, and are also seated on solid-web kneebraces, field-riveted to both members. At alternate panels an additional web-stiffener angle is field-riveted to the inside of the girder with clearance from the regular stiffener angle sufficient to receive between their flanges the connection plate for the sway-brace frames. The upper flanges of these frames are field-riveted to horizontal connection plates slotted to clear the stiffener angles and field-riveted to the girder flanges with two rows of rivets.

After the erection of the new spans, it was considered that lateral and transverse stresses would be satisfactorily transmitted to the substructure through the sway-brace frames, and the deep new transverse girders in the tops of the towers. Separate provision was required to transmit the longitudinal stresses to the bracing in the planes of the tower columns, which before had received it directly from the old trusses and girders in the former structure. To accomplish this, the tops of the columns which di-

rectly supported the 50-ft. spans are cut off flush with the top flanges of the new transverse girders and capped with horizontal plates, field-riveted to the columns and the girders; these horizontal plates have projecting wings on each side bent downwards to receive the pin-connections for the longitudinal diagonal rods in the battered planes, which were cut down to the required length. At the ends of the truss spans the top chords of the latter are braced to the tops of the tower columns with short inclined struts. The columns are not cut off, but their tops are capped, as previously described, with bent plates that receive the riveted connections of these struts and of another set, which are field-riveted at the opposite end to the webs of the 50-ft. girders. Their points of connection to the girders are connected by horizontal transverse struts formed with pairs of heavy angles. This system of braces provides a balanced framework and transmits the longitudinal stresses from both truss and girder spans through the wing plates on the tops of the columns which engage the upper ends of the longitudinal diagonal brace rods, as already described. This system was designed after the superstructure had been built and has been found to give satisfactory results,

the viaduct developing abundant stiffness and rigidity under heavy train traffic. The weight of new steel in the viaduct is about 500 tons. It was designed by Mr. Mason R. Strong, engineer of bridges, under the direction of Mr. C. W. Buchholz, then chief engineer and now consulting engineer of the Erie Railroad Co. The girders and trusses were built at the McClintick-Marshall bridge shops, and were erected by the railroad company's regular erection force in charge of Mr. W. H. Wilkinson, inspector of bridges.

A VERTICAL BLOWING ENGINE, installed at the North-Eastern Steel Co., at Middlesbrough, England, and having compound steam cylinders 48 and 90 in. in diameter, and two 90-in. air cylinders, showed, according to indicator cards, an efficiency of compression of 92.5 per cent. and a mechanical efficiency of 84.1 per cent., making a total efficiency, that is, the ratio of the ideal work required to compress the air isothermally to the actual work in the steam cylinders, 77.7 per cent. The engine, which was described in "Engineering," was built by Messrs. Davy Bros., Ltd., Sheffield.

Time Required for the Construction of Large Public Works.

In connection with the studies for the Isthmian Canal and the various schemes proposed within the past year or two for the additional water supply of the city of New York, statements have from time to time been made in the technical and daily press as to the time required for the construction of the works. This time element is frequently a most important consideration, particularly in the case of additional water-works needed to supplement a system already outgrown, or nearly so. In estimating the time which must elapse before a proposed scheme can be carried out, it is often the fact that a sufficient allowance is not made for the inevitable preliminaries of legislation and organization for public works, for delays due to possible strikes or litigations, or to the inefficiency or financial inability of contractors selected by the ancient and honored custom of awarding the work to the lowest bidder. Impractically hopeful estimates of the date at which a project will be completed add to the difficulties and anxieties of the engineers charged with carrying them through and indirectly cast discredit on the profession in general. These facts have led The Engineering Record to present at this time the records of several large and very well known municipal undertakings.

The results of the study are set forth in the form of the following brief partial chronologies of the Massachusetts Metropolitan water-works, the New Croton system for the supply of New York City, the Boston subway, the New York Rapid Transit Railroad, the Massachusetts Metropolitan sewerage systems, and the Philadelphia filtration plants. These works have all been so fully described in this journal that very little explanation of them is necessary. It is merely proposed to point out in a general, approximate way the time consumed in preliminaries and in some of the unexpected and intentional delays, and the total calendar time that passed between the inception and the completion of the works, without going into tire-some details of but limited value. It seems scarcely necessary to suggest caution against the unintelligent and indiscriminate applications of, or deductions from, the facts here presented. Reasons for delays or for rapid progress can be found stated or suggested in the records of the works, to some extent.

In its session of 1892-93, the Massachusetts legislature directed the State Board of Health to investigate and report upon a scheme for supplying the Boston metropolitan district with water to supplement, and in some towns supplant, the then existing sources of supply. On July 6, 1893, the Board instructed its chief engineer, Mr. Frederic P. Stearns, to take immediate charge of the investigations, and he at once began the organization of an engineering force. After nineteen months of diligent labor the Board presented to the legislature in February, 1895, a report, remarkable for its thoroughness and completeness, embodying the results of the studies of the engineers and other experts, and suggesting a well-considered scheme for a system of works, for organizing the district, and for providing the necessary funds, accompanied by a draft of an act for putting the scheme into effect. Surveys, borings and maps were made, and designs for some features of the works were elaborated with no little detail.

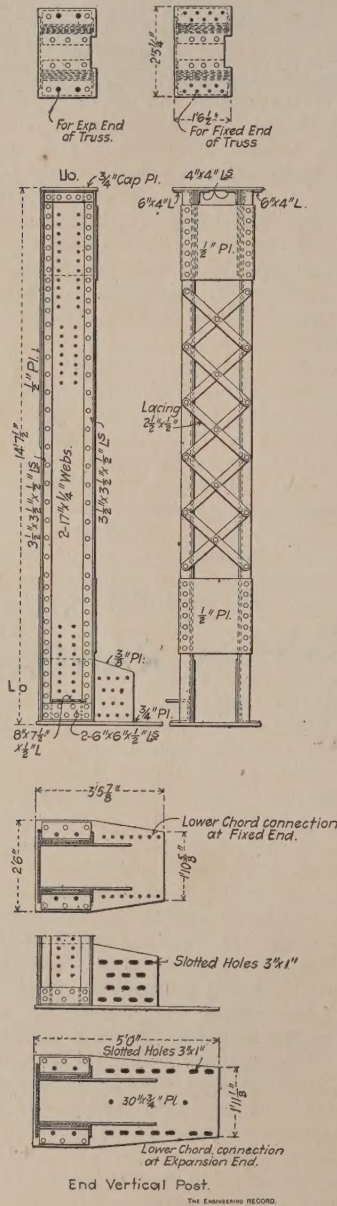
On June 5, 1895, "an Act to provide for a Metropolitan water supply" was approved by the Governor. Members of the Metropolitan Water Board were appointed soon after, met for organization July 19, and appointed a chief engineer July 24. The organization of an engi-

neering force was begun immediately, the chief engineer and most of his principal associates, as well as a number of the subordinates, having been connected with the preliminary investigations. About Aug. 1 the final location surveys for the Wachusett aqueduct were begun, and on Aug. 7 the final borings for the examination of the site of the Wachusett dam. On Feb. 14, 1896, eight months after the approval of the act, the first aqueduct contract was let, for the construction of a tunnel 2 miles long, and the last important contract for the aqueduct, for an open channel 3 miles long, was awarded Sept. 22, 1896, fifteen and a half months after the approval of the act. The tunnel and the 7 miles of cut-and-cover aqueduct were substan-

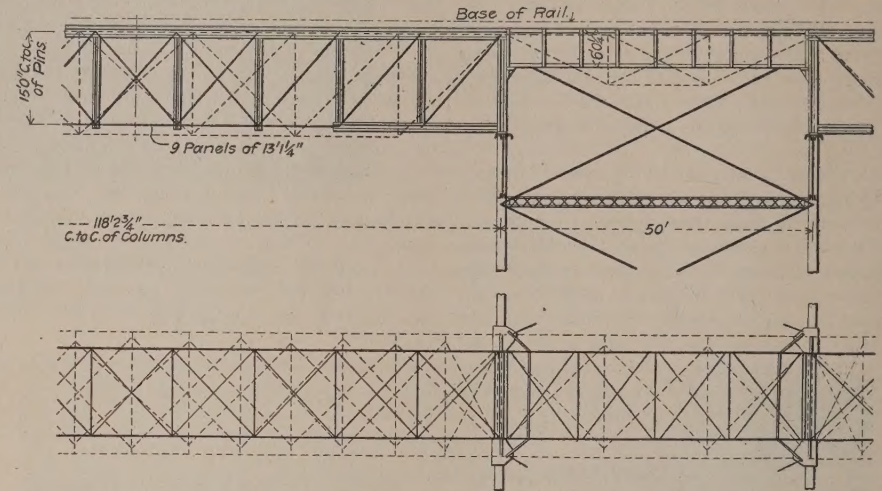
It is expected that the dam will be completed during the summer of 1905.

Meanwhile the stripping of the surface soil from the great reservoir, the building of two very large earth dikes, the relocation of highways and railways, the laying of large pipe lines, and the building of reservoirs in the distribution system, the erecting and equipping of pumping stations, and the constructing of other parts of the works were also in active progress. Next fall will, doubtless, see the practical completion of the system, ten years and three months after the approval of the Metropolitan

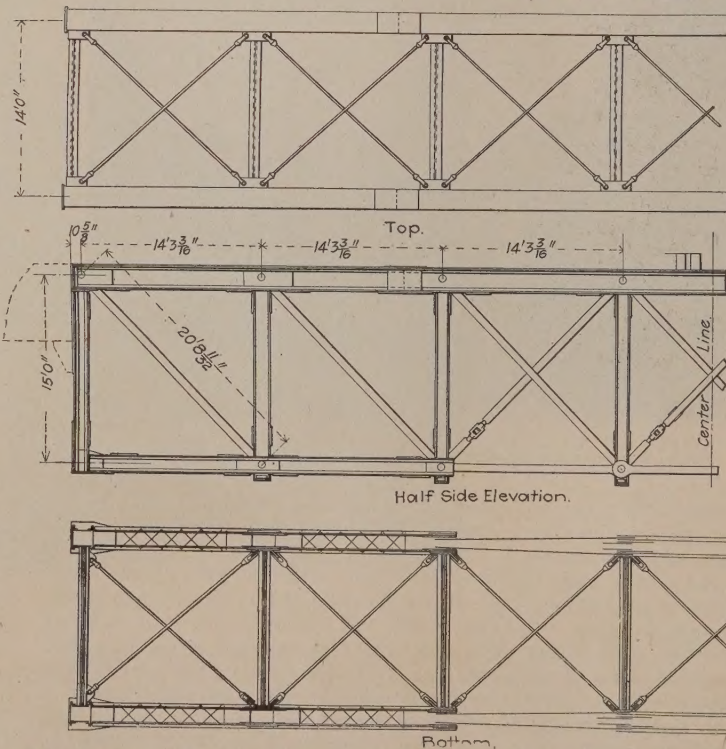
1900, the Weston aqueduct department of the engineering force was established to carry on the construction, and on May 9, 1901, the first contracts were let, two years and three months after the beginning of the final surveys. This aqueduct has a total length of 13.4 miles, comprising five tunnels aggregating 2.3 miles, 9.1 miles of cut-and-cover, 1 mile of pipe siphons, and 1 mile of open channel and equalizing reservoir. On Dec. 29, 1903, the first water was delivered into the district through the new aqueduct, four years and eleven months after the beginning of the final surveys, and two



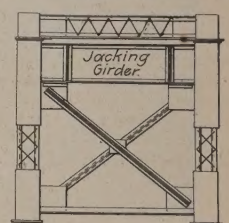
Details of Old and New Spans of Portage Viaduct, Erie Railroad.



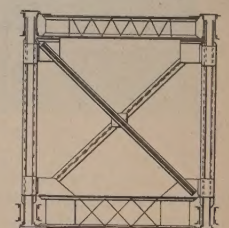
Plan and Elevation of Tower Span and Connecting Span. Old Spans shown Dotted.



Half Side Elevation.



End View.



Intermediate Section.

New Truss Span.

tially completed by December, 1897, and the open channel by March 7, 1898, on which date water was first conveyed through the aqueduct, two years and nine months having elapsed. This aqueduct has a capacity of 300,000,000 gal. per 24 hours, and its construction was pushed vigorously. Not until Oct. 1, 1900, was the principal contract for the Wachusett dam made, but the early construction of a temporary dam and flume as portions of the works for the control of the river during the building of the main dam rendered possible the partial utilization of the new source at the date given above,

water act, and about twelve and a half years from the date of the beginning of the investigations by the State Board of Health.

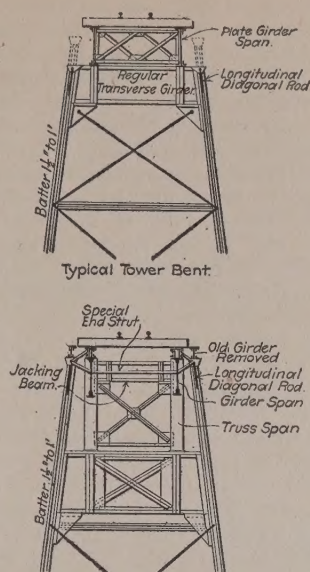
Simultaneously with the construction of the Wachusett works, the Metropolitan Water Board built the 300,000,000-gal. Weston aqueduct to supplement the two old aqueducts conveying water to the distribution system from Lake Cochituate and the Sudbury River. In February, 1899, surveys and studies for this aqueduct were begun, but some preliminary studies, including a fairly careful location, had been made by the State Board of Health. On Sept. 24,

years and eight months after the first contract was signed.

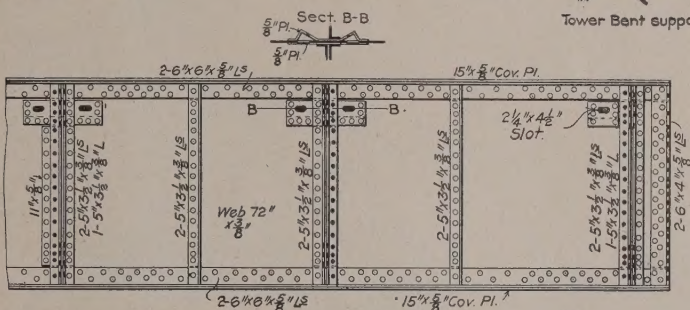
From their inception the Metropolitan works were vigorously pushed (except as financial economy required the deferring of certain parts), by an unusually able management in both administrative and engineering branches, from the board and the chief engineer down, almost, if not quite, absolutely free from political influence. Unusual pains were bestowed upon the preparation of the various features of the works before construction was begun, and inspection was intelligent and thorough. Never-

theless, a few unforeseen difficulties developed and some trouble and delay were experienced on account of contractors who proved unequal to their tasks. The cost of constructing these works, exclusive of land and damages for water rights and other claims, will be about \$26,000,000 in round figures.

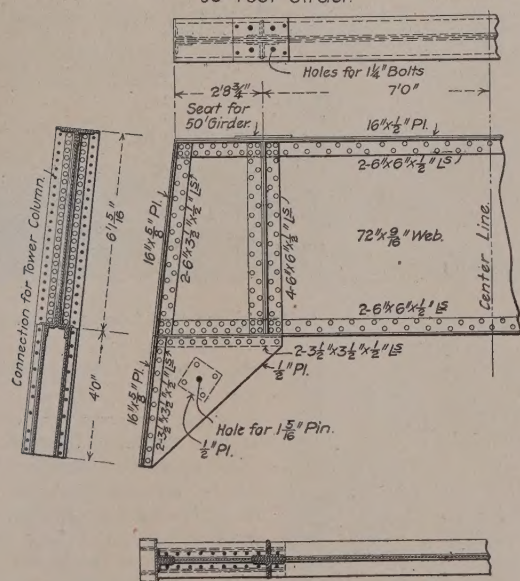
Published reports of the new Croton works do not give their history in so much detail, but the principal steps in their progress can be briefly stated. After some preliminary agitation and investigation, the Aqueduct Act, so-called, was passed by the Legislature in June, 1883, and the commissioners met for the first time on Aug. 8. On Dec. 13, 1884, eighteen and a half months later, the contracts for the first sections of the New Croton aqueduct were awarded. On July 15, 1890, this aqueduct was first put into service, although not wholly finished, seven years and two months after the passage of the act; it is about 33 miles long, mostly in tunnel, has a capacity of 300,000,000 gal. per day and cost about \$25,000,000 for construction work.



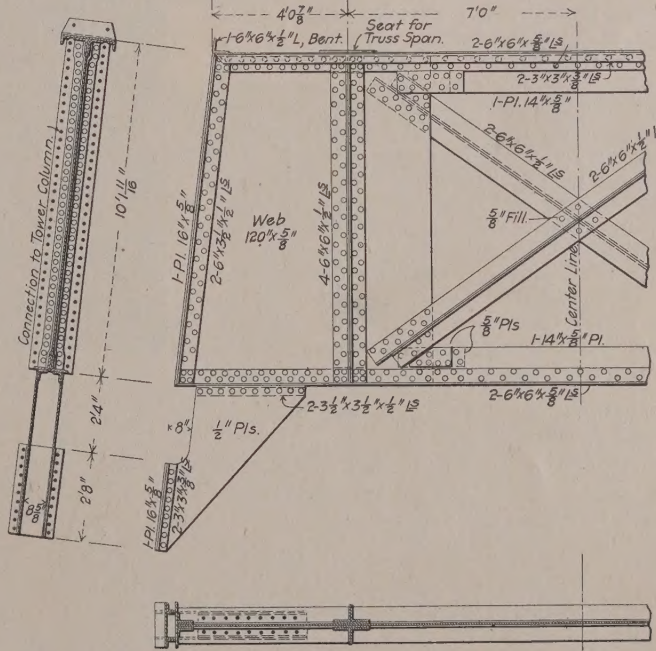
Typical Tower Bent



59-Foot Girder



Regular Transverse Girder and Kneebrace.



Transverse Girder for Truss Span

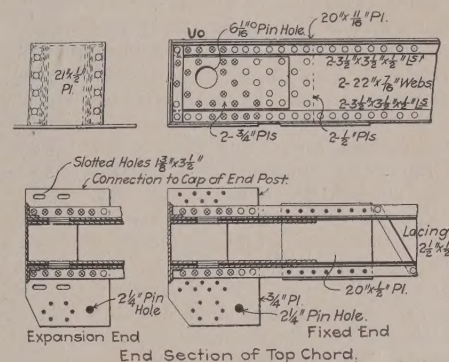
Details of New Girders and Top Chord of 100-Foot Span, Portage Viaduct.

On Feb. 7, 1887, the Aqueduct Commissioners adopted a resolution for investigating the design and location of the principal dam, and on March 7, 1888, the board of experts on the Quaker Bridge dam was appointed, four years and nine months after the act was signed. The experts reported Oct. 1, 1888, but it was not until Jan. 22, 1891, that the commissioners adopted a resolution for constructing the New Croton dam at the Cornell site. On Aug. 26, 1892, a contract was made for building the New Croton dam, the Quaker Bridge site having been abandoned. Thus nine years and three

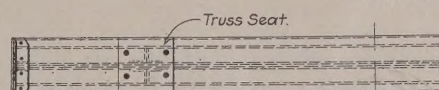
months were consumed by investigations, delays and the preparation of drawings and specifications for the principal dam. It is now confidently expected that the New Croton dam and reservoir will be completed by October, 1905, twenty-two and a half years from the date of the act and over thirteen years from the signing of the contract. During the twenty-two years, however, four other impounding reservoirs with their dams and appurtenant works have been completed and Jerome Park reservoir, a very large distributing reservoir, has been about three-quarters completed. The total

amount expended during these years by the Aqueduct Commission for construction, engineering and administration, not including land, is approximately \$42,000,000. No little time has been lost by inefficient contractors on some parts of the work, by investigations, by changing the legal working day from ten to eight hours and by strikes, while the progress has been further impeded by the general slowness of municipal methods.

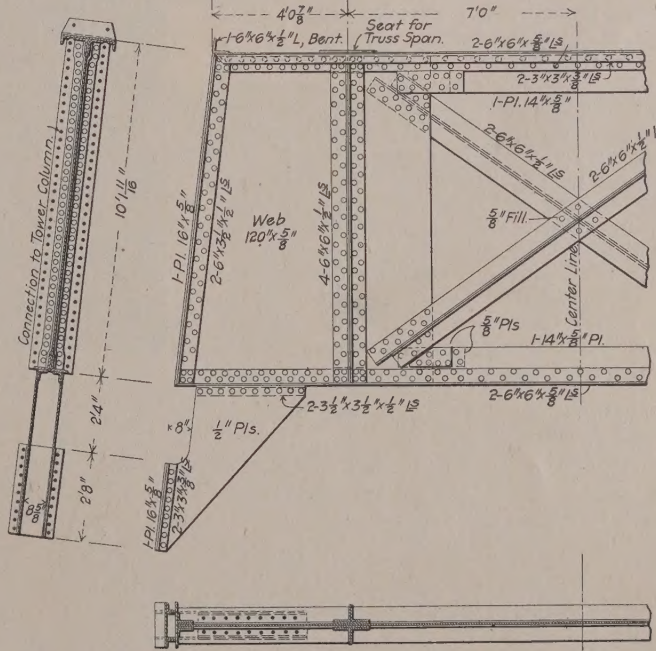
Another example of well managed work is the Boston rapid transit system, but in this case, also, more time has passed between the beginning and the completion than would ordinarily be estimated as required. On June 3, 1891, by act of legislature a commission was created to promote rapid transit for the city of Boston and its suburbs. On April 5, 1892, this com-



End Section of Top Chord



—Truss Seat



Transverse Girder for Truss Span

mission presented a long report with many detailed studies, maps and drawings. After some other investigations, an act was approved July 2, 1894, under which the Boston Transit Commission was appointed. On March 20, 1895, the first contract was awarded, nearly three years and ten months from the date of the first act and eight and a half months from the final act. During September, 1897, a portion of the subway about 0.8 mile long was put into service. Subsequently other sections were put into service from time to time, and the East Boston tunnel was opened to travel on Dec. 30,

1904, two years having passed between the completion of the subway and the beginning of the tunnel, the construction of which was permitted by the original law, but required by later legislation. The total length of the system, including the Charlestown bridge, is about $3\frac{1}{2}$ miles, and it has cost about \$9,000,000, not counting the equipment. It appears that approximately thirteen and a half years transpired between the preliminary legislation and the finish, which was ten and a half years from the final act creating the constructing commission.

Turning to another municipal transportation undertaking, published reports show that the New York legislature passed an act in 1891, continuing the rapid transit railroad commission appointed in New York City under the act of 1875 and authorizing investigations, the adoption of routes and further initial steps toward a system of rapid transit for the metropolis. On Dec. 29, 1892, a franchise for constructing and operating a rapid transit railroad was offered for sale, but there were no bidders. On May 22, 1894, an act was signed by the governor creating the present Board of Rapid Transit Railroad Commissioners of the City of New York, but political, financial and legal difficulties caused so much delay that it was not until Jan. 15, 1900, that a contract for the work was finally made; on March 24, 1900, construction was formally begun. After the latter date, however, the work was put forward with a celerity which, considering the difficulties, was most creditable to the commission, the engineering staff and the contractor, in spite of several troublesome strikes. Nearly six years, however, had been lost subsequent to the signing of the act. By Oct. 27, 1904, a considerable portion of the subway was sufficiently completed to be opened to traffic. It is expected that by April, 1905, the system covered by the original contract will be finished. The period from the passing of the act to the completion of the work will thus be about eleven years. The total length of the subways and viaduct comprised in the rapid transit railroad is 20.8 miles, and the cost for the structure has been \$40,000,000 and for equipment \$18,000,000. When comparing the amount of money expended per annum on this work with the yearly expenditures on large water works, it should be borne in mind that the rapid transit construction involved the use of large quantities of relatively expensive materials, such as structural steel, fabricated in established shops at a distance from the subway.

The Massachusetts Metropolitan sewerage systems were inaugurated by an act signed June 7, 1889, after a report on the subject had been presented earlier in the same year by the State Board of Health. The chief engineer was appointed in October, 1889, and in the following May the construction of the North Metropolitan sewer system was begun, less than a year after the signing of the act. The Charles River Valley system was begun in June, 1890, and completed and put into use May 1, 1892, or three years after the act. It is $8\frac{3}{4}$ miles long and cost about \$800,000. March 10, 1893, the office of the commission together with many records and drawings were burned, trammeling the work to some extent. In December, 1896, the North Metropolitan system was completed, seven years and a half after the act was signed. Its length is 41 miles and it cost about \$5,000,000. The main line of this system was put into operation June 1, 1895, six years after the signing of the act.

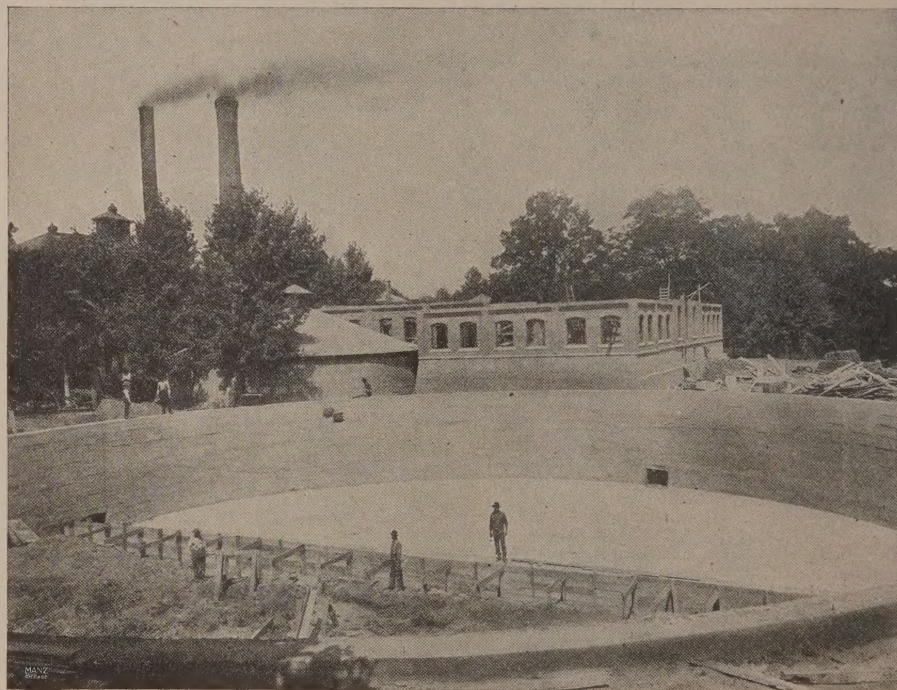
In February, 1899, the Metropolitan Sewerage Commission made a report on a high-level gravity sewer for the south metropolitan district, and on May 27 following the Massachusetts Legislature passed an act providing for

the construction of the sewer. On Nov. 20, 1899, work was begun. The high-level sewer was put into operation in October, 1904, and will be completed in January, 1905, about five and a half years from the signing of the act. Its length is approximately 17 miles, and it will cost, in round numbers, \$6,000,000.

In Philadelphia the improvement and extension of the water supply was agitated for a number of years before the effective action was taken. On May 9, 1899, the mayor appointed a commission of expert engineers to study the subject and report by Sept. 15 following, which they did. In January, 1900, the city government made the first appropriation for the construction of the new works and in February Mr. John W. Hill was put in charge of the work as engineer. On March 20, 1901, the first important contract was awarded, for building the smallest of the four proposed filter plants, a year and a half after the report of the commission of experts. The system for the extension, improvement and filtration of the city's water supply comprises four filter plants of a nomi-

more time is required for the preliminary and final surveys and office studies and the preparation of the contract drawings and specifications, as well as in the organization of the administrative staff, than is at first estimated. And more time can be profitably expended in the careful and thorough preparation of great works than is sometimes allowed. Policies once inaugurated generally are followed even if they are not the wisest, and once works are well begun on a given location there they generally must be finished, notwithstanding that much money and time might have been saved by a further examination of possible sites.

Market conditions as affected by the total amount of work in progress during any given period must also be observed. In estimating the time and expenditure required for the construction of a system of additional water works for New York City, or any other large works in that vicinity, some consideration should be given to the probable demand for engineers, for laborers, for contractors' forces and for supplies on account of other great projects re-



Clear Well, Anderson Filtration Plant, Showing Building and One Sedimentation Basin.

nal combined capacity, at a 3,000,000-gal.-per-acre-daily rate, of 300,000,000 gal. per day, three large pumping stations, three preliminary filters, a large distribution reservoir, a large conduit in deep tunnel about two miles long and several large distributing mains. These works are still in progress and will probably not be completed before the middle of 1906, or at the expiration of seven years from the report of the experts. The period of active construction, however, will have been five and a half years. In round numbers the total cost of these works will be \$25,000,000.

The works mentioned are all located in the eastern part of the country; but the records of undertakings in other regions, such as the Chicago drainage canal and the U. S. Reclamation System, would also have a bearing on the subject under discussion. That a considerable period should have elapsed between the inception of a great public project and the beginning of actual construction does not necessarily imply that the time has not been well employed. Although time is occasionally wasted, or important works blocked by persons of improper motives, it is frequently the case that much

cently begun or soon to be undertaken in that region.

AN IRRIGATION CANAL in Italy about 31 miles long has been rendered navigable for 4.35 miles and part of its water utilized for the production of power by the development of a hydroelectric plant at Turbigio. There are five units each having a double horizontal turbine of 1,500 h.p., one machine being ordinarily held in reserve, and the working head approximates 28.5 ft. In order to maintain a practically constant water level at the power house without affecting greatly the water level in the irrigation canal, regulating works have been constructed, including in part three sluices controlled electrically to maintain automatically the level in the turbine basin supplied by the sluices. The surplus water at the sluices reaches the river by a fall divided into three steps. At each step a water cushion is provided, as a protection against erosion, by a dam or wall 31.5 in. high. In each of these walls are also vertical openings so that part of the water passes through the openings while the rest goes over the top.

The Water Filtration Works at Anderson, Ind.

By F. B. Leopold.

The citizens of Anderson, one of the prosperous and progressive small cities of central Indiana, have just seen the culmination of the results of several years' insistent demand for pure water. Anderson is a city of 25,000 people, and is located in the center of what was once the

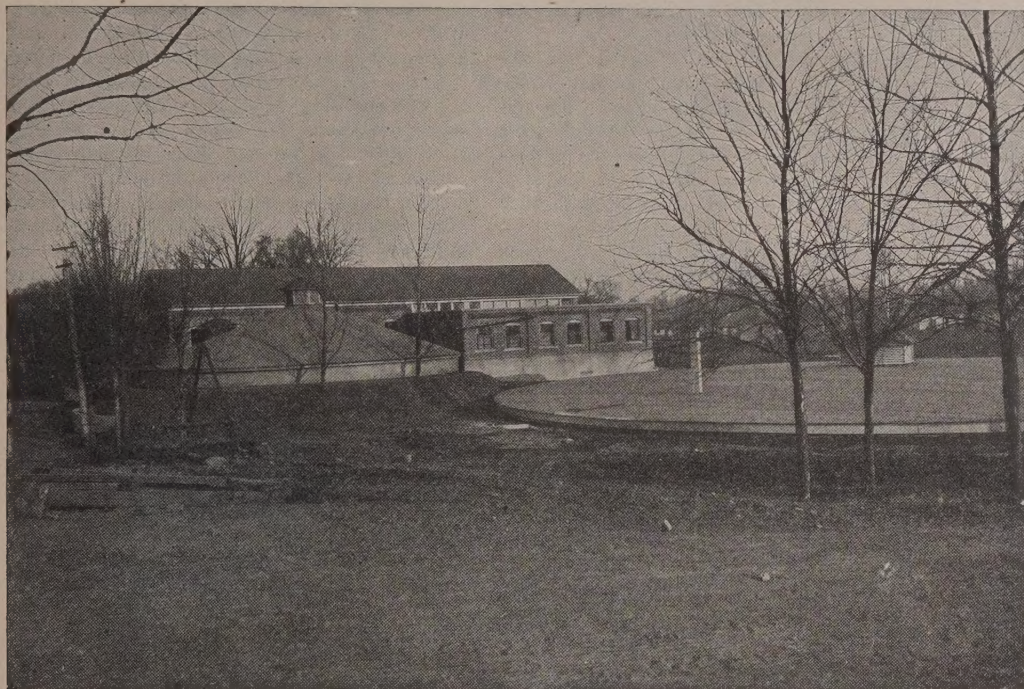
about May 1, 1904. The first water passed through the plant Nov. 19 last, and a few days later the plant was put in actual service, supplying filtered water to consumers.

It was the desire of the city authorities to construct the plant on the most permanent and modern lines, and at the same time not to overreach their financial resources. Fortunately, the peculiar local combination of circumstances was

at a cost of about 60 cents per yard, on the ground.

It was decided to build the plant as largely as possible of concrete, and the design was such as to lessen the cost of construction as much as consistent with good work. The general design is for a plant with an ultimate capacity of 8,000,000 gal. daily, the settling basins, coagulant plant, piping and machinery being of ample proportions for this amount. The original intention was to build only four of the 1,000,000 gal. filtering units. Before actual construction began, however, it was decided to build the concrete basins for six units, but to equip only four of them at the present time.

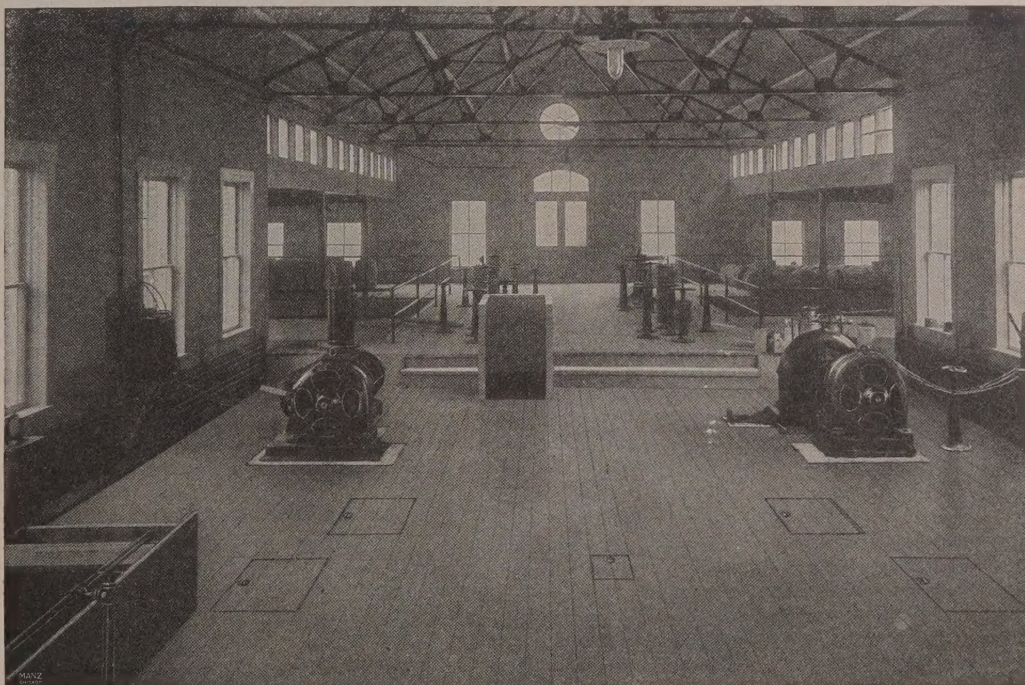
The general type of construction of the Anderson system is much the same as that of two other plants in the central West, those at Moline and of Danville, Ill. (For the Danville plant, see Engineering Record, Dec. 26, 1903.) The arrangement of the Anderson plant, however, is distinctive in that the three main features—the coagulating basins, the filter house and the clear wells—are entirely separate parts of the construction. The two coagulation basins, into which the raw water is delivered by the low-service centrifugal pumps, are of concrete, circular in form, 50 ft. in diameter and 15 ft. inside depth. Of this depth 9 ft. is above the surface of the original ground line. After completion, however, an embankment which will be sodded later was thrown around them to within 24 in. of the top of the wall. To protect a portion of the circumference, the embankment is supported by a segment



General View of the Anderson Water Purification Works.

Indiana gas belt. The water supply is drawn from White River, which was an exceptionally good source of supply in the early days. Being fed almost wholly by springs, it was for the greater portion of the year cool and without turbidity. With the discovery of gas, however, cities and towns teeming with manufacturing industries sprang up along its banks, taking water from and dumping sewage and refuse into it, until at the present time it is unfit for domestic use without purification. As a result of this condition of affairs and the insistent demand for better water during the past several years, the board of water commissioners and the city council, in the spring of 1903, appointed a joint committee to act with a citizens' committee from the local business associations in bringing about a relief from the existing conditions. After some investigation it was determined to seek a new supply in a well system, and with this end in view, several test wells were drilled. Further research by the joint committee led to the conclusion that the most certain and practicable plan of obtaining pure water was by establishing purification works for their present supply.

Bids for a purification system were advertised and received early in September, 1903. The submission of the bids and plans led to an extensive investigation of plants in operation by the various bidders, and resulted in the recommendation on Oct. 9 of the acceptance of the plans proposed by the New York Continental Jewell Filtration Co. Because of the lateness of the season, construction was not begun until



Interior of Operating Room; Filter Compartments in Back of Building.

favorable to the accomplishment of their ends. A suitable site was at hand near the present pumping plant. This was a plot of ground between the pumping station and White River, there being at present but 30 ft. between the pumping station and filter building as erected. Building material was also to be had at an unusually low price. Sand and gravel of best quality and quantity for concrete could be obtained

of a concrete wall, which may be observed in the engraving showing a general view of the plant. For the remainder of the distance around the tank, a natural grade of 2 to 1 carries the embankment to natural ground level.

These basins are covered with a conical roof surmounted by a ventilator. The roof is supported by a steel truss frame and is covered with asphaltum cement. In the interior a series

of three baffle walls are built, these being so arranged as to bring about an almost complete displacement of the water as it passes through the basins. This insures the benefit of the full capacity of the basins for sedimentation. To prevent overflow, the inlet is controlled by a system of floats, and the outlet is just below the surface on the opposite side. The engraving of the finished plant gives a clear view of one of these basins and the embankment surrounding it.

The filter building proper is a T-shaped building 95 ft. long by 32 ft. 3 in. wide, with wings on each side at the rear end. These wings are 31 ft. 6 in. long by 45 ft. wide, and contain six filter compartments, each of 1,000,000 gal. capacity. Four of these are completely equipped, leaving two in reserve for future equipment as required. The building also contains the operating room, machinery for washing, mixing and supplying coagulant solutions, and a laboratory.

The foundations for the building, the filter compartments and tanks for mixing the coagulant solutions are entirely of concrete construction. Above a line on a level with the top of filter basins, the walls are of hard burned brick rising to a height of 12 ft. The roof of the main building is of slate carried on steel trusses. That of the wings is nearly flat and is of a composition roofing. The interior is plastered and painted and is floored with 2-in. standard yellow pine flooring. Completely surrounding the filter compartments on either side is a balcony protected by a hand-rail. The building contains many windows and the interior arrangement is such as to give an unusual amount of clear space. All the parts of machinery and filters are open and accessible, but at the same time long-span trusses and useless vacant room requiring large heating arrangements are avoided.

The laboratory is a room 7 ft. in width by 45 ft. in length, carried across the end of one of the wings. It is perfectly tight and is almost all of glass. Facing the south, as it does, with windows east and west, it is always assured of the best light.

The equipment of the filters is of the standard New York Continental Jewell type, similar to those of the plants at Little Falls, N. J., and Moline and Danville, Ill. They employ the Continental trap screen screwed into laterals, which, in turn, are screwed into a large cast-iron header carried from end to end of the compartments through the center. These screens are spaced over the entire bottom of the bed on 6-in. centers both transversely and longitudinally. The air pipes are carried parallel to and about 6 ft. above the main cast-iron headers. Branches drop to the header at intervals of 24 in., thereby insuring an even distribution of the air pressure. The weir troughs extending across the end and sides of the basins are unusually deep and secure a strong flow during the washing process. These filters are equipped with the Weston automatic controlling devices for regulating the flow. They are also supplied with loss-of-head gauges to indicate the time when the beds require washing.

The filtering material is composed of a 6-in. layer of crushed quartz of the size of a pea, on top of which is placed 36 in. of No. 1 special Red Wing sand.

The coagulant plant is designed for the use of either alum or sulphate of iron solution, and consists of four concrete tanks concealed below the floor. These tanks are 12 ft. in diameter and 10 ft. deep. Two of them are intended for lime-water solution, and the other two, which are equipped with stirring devices, for either the iron or alumina solutions. Connected to each pair of solution tanks is a Goulds triplex pump arranged to be driven either by an electric or water motor, as occasion may demand. These

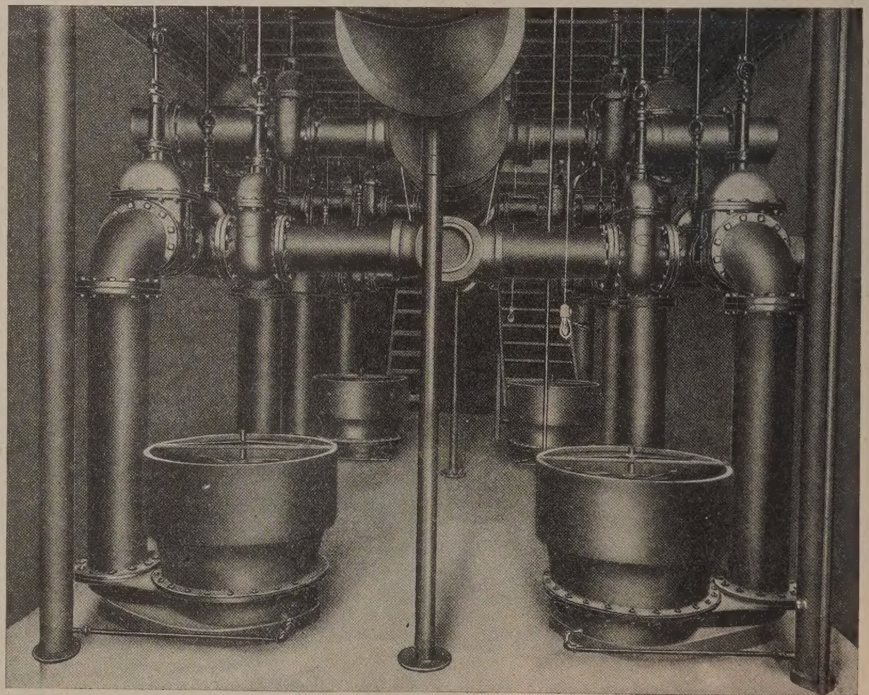
pumps raise the solutions into two small, elevated, gravity feed tanks, from which they are distributed to the inflowing raw water. Hard rubber pipe is used on the line supplying the iron or alumina solution.

Located on the main floor and on the opposite side of the room from the solution pumps are the dissolving tanks for the lime and iron. These are built of cypress, rectangular in section, and have a screen box at one end. A spray arrangement for supplying the water for dissolving sulphate is also provided.

The machinery for furnishing the air consists of a Root positive rotary blower direct-connected to a Westinghouse motor. The discharge from the blower is carried through a main under the floor to the pipe gallery between the two lines of filters. Here it is connected to the main header of each of the filters through a controlling valve.

A Lawrence centrifugal pump, direct-connected to a Westinghouse motor, supplies the wash water. The suction of this pump is connected to the clear well. The discharge is carried by a main running through the pipe gallery to the screen system of each filter, the sup-

100 ft. in diameter by 18 ft. in depth, with concrete walls and covered with a composition roof, this being supported on steel I-beam framework, carried on cast-iron columns. There was nothing out of the ordinary in the construction of this plant except in the building of this wall, where, on the side nearest the building, there was encountered a 4-ft. pocket of quicksand, the extent of which it was difficult to determine. About 90 ft. of the circumference of the wall lies over this pocket, which extends a distance of 20 or 25 ft. toward the center of the wall and apparently back under the filter building. It was decided after some investigation to carry the wall on piling driven close together and to a solid foundation. The spaces between the piles were filled with concrete, so as to confine that portion of the pocket inside the well in such a manner that it will not be affected by the water pressure within. As the top level of the quicksand was about 12 in. below the bottom of the well, it was decided to raise the bottom of that portion of the well covered by sand bed 2 ft. A division wall about 5 ft. in height was also built, dividing the basin into two parts, with a double inlet and outlet, so that, in the possible event



Pipe Gallery between Filters, Showing Weston Controllers.

ply to these systems being governed by controlling valves. There is also a direct connection to the force mains to provide for accidents. The accompanying interior view of the filter building looking toward the rear, shows the blower, wash pump, valve platform and rail around the filters.

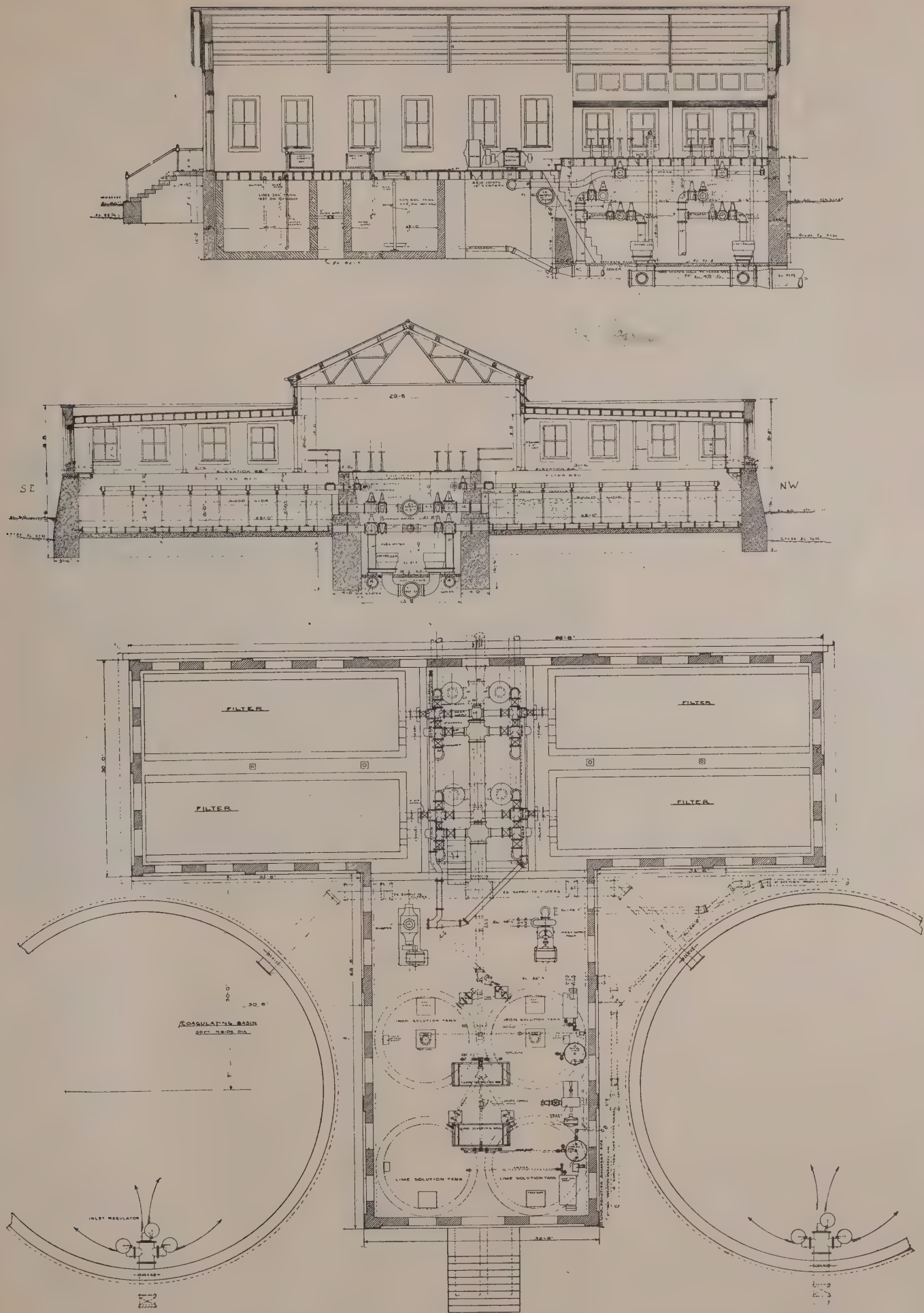
A noticeable feature of the pipe gallery, which runs between the two rows of filters, is its roominess and the accessibility of all parts. One of the accompanying engravings gives an excellent view of this gallery, showing the arrangement of the piping and the Weston controllers. The large pipe overhead is the main inlet conduit from the coagulating basins, and is joined to the outlet from them by a tee inside the building. The inlet from each basin is controlled by a gate, so that one may be used independently of the other. The clear water conduit is located below the floor of the pipe gallery, the controllers discharging into it through special connections. This conduit carries the purified water to the clear-water receiving well.

The clear well is a large, circular reservoir

of any unlooked-for crack in the bottom, due to compression of this sand bed, there would be no interference with the operation of the plant. A general view of the plant is well shown in the accompanying engraving. The large, circular, flat roof in the foreground covers the clear well. The filter building is in the rear, and one of the two coagulating basins is shown in the angle of the building.

The drawings give a clear idea of the detailed arrangement of the plant. The plan shows but four filter basins; while this is all that are equipped for operation, two more were constructed for future use, as may be observed from the several engravings. The clear well is not shown in the drawings.

The relative arrangement of the filters, pipe gallery and coagulant solution tanks, are shown in the sectional views. The two low service pumps employed are of the Worthington centrifugal type, direct-connected to vertical engines, and are located in the old pumping station to the south of the plant. These pumps take the raw water from the old intake well and deliver



GENERAL ARRANGEMENT OF THE WATER FILTRATION WORKS AT ANDERSON, IND.

it to the coagulating basins. From these it flows by gravity through filters into the clear well, at which point the high service pumps take it and distribute it, by direct pumping, to the city system of distributing mains.

The plant was designed by Mr. Walter Wagner, of Chicago. The entire equipment was furnished and installed by the New York Continental Jewell Filtration Co., of Chicago, while the concrete construction was built by Mr. C. H. Daniels, of Anderson. During construction, Mr. H. H. Rogers, city engineer, and Mr. Henry Drach, water works engineer, of Anderson, superintended the work for the city. The completion of this plant puts the city of Anderson in the front rank of the cities of the country in the character of its water supply.

The Board of Water Commissioners, of which Mr. J. J. Netterville is president, realizing that careless operation of even the best of filtration plants destroys their efficiency, have not been satisfied to rest on their honors on the completion of the work, but have taken the proper steps to see that the object for which the plant was installed shall always be attained. A first-class laboratory has been equipped and Dr. C. L. Norris has been appointed as bacteriologist in charge. Daily tests and reports will be made of the condition of the water, thereby insuring the fullest measure of protection.

The operation of this plant and results accomplished will undoubtedly be watched with considerable interest by the cities of central Indiana, and more especially by those taking their water supply from White River. This river, as has been previously stated, was formerly considered one of the best surface supplies, but has become one of the most contaminated in the State. The volume of water flowing through its channel is at no time large, and in the summer months is barely 24 in. in depth. Owing to the extreme length of the river in its windings, it carries the sewage of an enormous population, and its contamination is greatly increased by the factory wastes from many strawboard, pulp and paper mills, steel plants, and other industries located along its banks. By means of the newly constructed filter plant, it is proposed to deliver this water to the consumers bright, clear and free from suspended matter, with a removal of 97 per cent. of the bacteria when the raw water contains 3,300 or more per cubic centimeter. When the raw water contains less than 3,300, the filtered water will not contain more than 100 bacteria per cubic centimeter.

Combined Chemical and Bacterial Sewage Treatment, Withington, England.

A few months ago, the Association of Municipal and County Engineers visited Withington and inspected its municipal works. One of the most interesting is the sewage treatment plant, which was explained to the visitors substantially as follows by Mr. A. H. Mountain, engineer and surveyor to the Withington urban district council. These works have to treat about 3,600,000 gal. daily, of which about half is subsoil water entering the older defective sewers.

The sewage on arrival at the outfall works is delivered into detritus tanks, of which there are two, each having a capacity of 50,000 gal. In these tanks is deposited the heavy grit and coarser particles held in suspension by the sewage. From these detritus tanks the sewage passes forward into two sedimentation tanks, where further deposition of the finer solid matters takes place. On its way to these tanks the sewage passes over blocks of aluminoferric placed in the channel, and the sedimentation is thereby materially assisted.

The sedimentation tanks have capacities of

452,000 and 484,000 gal., respectively. From the sedimentation tanks the sewage passes to the first contact bacterial-beds along concrete channels 7 ft. wide. The detritus and sedimentation tanks are each provided with floating arms 12 in. in diameter, communicating with a conduit leading to the pumping sump, so that the top water may be taken off whenever it becomes necessary to convey the sludge from any one of them. Each tank is also provided at its western and deepest part with a valve, communicating with an open channel leading to the sludge tank, which adjoins the western end of the buildings, whence the sludge is lifted into the rams and presses.

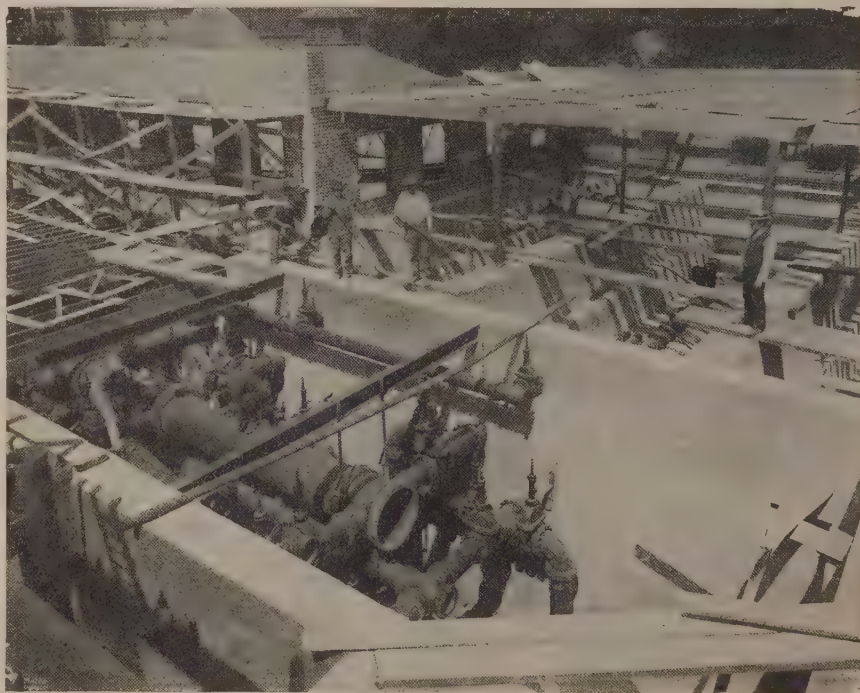
The sewage after leaving the sedimentation tanks proceeds to the chamber containing the automatic distributing apparatus, which was constructed by Messrs. Mather & Platt, of Manchester, and is on the system known as Ridgeway's patent. The apparatus consists of ten flap valves, each 3 ft. wide by 2 ft. deep in the opening, worked by cam wipers on two shafts, which are coupled by a connecting rod.

The shafts are worked by a float in an ad-

joining chamber, which float chamber receives, by an adjustable weir and at the rate of sewage flow, a quantity sufficient to raise the float to its maximum height, this corresponding with the completion of the filling of one first contact bacterial-bed. Immediately upon this taking place a supplementary valve comes into operation which causes the float chamber to empty, the float to fall to its lower position, and by a pawl and ratchet on the cam shaft to release the valve of the filled first contact-bed, and to open the valve of the next in series. This operation is repeated each time a contact-bed is filled. The first contact-beds are ten in number, each having an area of 2,900 sq. yds. The beds are constructed with walls of blue brick set in Portland cement mortar, coped with blue copings, and have floors of Portland cement concrete 12 in. thick. The beds are filled with screened clinkers and cinders from $\frac{1}{4}$ to 2 in. in gauge to a depth of 3 ft.

The sewage is conveyed by open channels and 27 in. diameter pipes from the valves in distributing chamber to the center of each contact-bed, where the sewage overflows at a little above

the surface level of the bed, and is fed over the surface thereof by eight socketed earthenware carriers 12 in. wide by 6 in. deep, radiating to the extremities of the bed. This arrangement causes a very even distribution, and is found to work very satisfactorily. Each bed is provided with half-pipe, red earthenware butt-jointed tiles, 9 in. diameter, laid on the floors of the bed and covered with coarse clinkers, in order to permit the effluent to be freely drawn off when the bed is emptying. These drains communicate with a semi-circular chamber at each outlet valve. The sewage is held in contact about two hours, and is then passed by Ridgeway balanced valves to the second contact-beds. These balanced valves are of the same sized opening, 3 ft. by 2 ft., as the valves in distributing chamber above described, but are worked by a balancing drum which is filled, by means of a flexible pipe coupling, direct from the first contact-beds. A timing cock permits the drum to fill at any desired rate. As soon as the drum is filled to the necessary extent it falls, opening the valve and permitting the contents of the contact-bed to discharge



Construction View of Pipe Gallery and Filter Compartments, Anderson, Ind.

from the first contact-bed to the corresponding second contact-bed, or from the second contact-bed into the effluent channel as the case may be, the system being alike in each case.

The second contact-beds are also ten in number, and of the same area, depth and construction as the first contact-beds. Eight of each are worked in series, two of each being in reserve and resting. By changing the "wiper" on the shafts at the distributing chamber any desired first contact-bed, with its corresponding second contact-bed, may be cut out or brought into operation.

The operation of the works was stated by Mr. Mountain to be most satisfactory, both to the Council and the Mersey & Irwell Joint Committee.

THE BITULITHIC PAVEMENT laid in Salem, N. J., four years ago has required no repairs up to the present time, and is in good condition to-day. This was one of the pioneer pavements of its type in the country, and has been so satisfactory to the citizens that others like it have been put down there.

The New Works of the Fiberloid Company, at Springfield, Mass.—II.

Power and Lighting.—The plant is equipped throughout with Westinghouse type C induction motors, aggregating about 700 horse-power. Current will not be generated at the works, but purchased from the United Electric Company, of Springfield, which has three independent generating stations, two run by water power and one by steam, so connected on a triangle that if one is disabled the remaining two can, by temporary overloading, be made to supply all the customers some power, even if not the full contract quantity in every case, until repairs can be made. This arrangement of the power company's plants was believed to be a sufficient guarantee as to the reliability of the service to warrant the Fiberloid Company in purchasing power from an outside source, in view of the fact that an economical contract could be made.

As a matter of security, however, and because a building was needed for the boiler plant required to generate steam for manufacturing

the two forming a partition between the transformer room and the engine room. From the switchboard the low-tension wires are taken into the tunnel, where they are suspended close under the roof, as shown in the cross-section of the tunnel, on heavy porcelain insulators hung from the lower flanges of the I-beams in the roof.

In the acid building all exposed metal parts, excepting the contacts, were given a coat of best quality asphalt varnish before shipment and another coat after erection, and all screws were dipped in asphalt varnish immediately before being driven, their heads being subsequently coated again.

The specifications require the wires to be of such cross-sectional areas that the maximum line loss on the lighting circuit shall not exceed 5 per cent. from the transformers to the lamps, and on the power circuits the total loss from the transformers to the motors shall not exceed 1 per cent., nor the drop exceed 15 volts with full loads on the motors. The wires in the tunnel are drawn taut and held by globe strain insulators and turnbuckles at both ends of the

tors in the rolling, mixer and acid buildings are set on the floor.

Excepting the four smallest buildings, the works are lighted by incandescent electric lamps, the number of lights in the different buildings varying greatly according to the nature of the work done, the total number being nearly 1,100. The electric light and power equipments are being installed by the New England Engineering Company, New York City.

Five 140-horse-power return tubular boilers made by Edward Kendall & Sons, of Cambridgeport, Mass., have been installed in the boiler house and two other boilers of similar size and pattern are to be moved from the Newburyport works. There is room also for two additional high-pressure water-tube boilers, if these should ever be needed in the future to furnish steam for steam-turbine or other generating units to supply electric power. The steam will be used largely for heating and drying materials during the process of manufacture and for warming the buildings in cold weather. Certain portions, however, will be required for the engine driving the ammonia condensers, for the fan



The Fiberloid Company's Works from the Northeast, during Construction.

purposes and heating, for the refrigerating machinery, for the transformers and for pumps, it was decided to build a power house in which a generating equipment could be readily installed if it should ever become advisable for reasons of economy or reliability to do so. The general arrangement of this power-house is shown by the accompanying illustrations.

The current supplied by the United Electric Company is a 5,000-volt two-phase alternating-current of 60 cycles per second, and is delivered through a switchboard to transformers installed in the southerly end of the engine-room. Two 375-kilowatt oil-cooled transformers reduce a portion of the current to 550 volts at three phases for three motor circuits, and two 50-kilowatt transformers reduce another portion of the high-tension current to 220-volts, so that it can be run as two separate phases for two incandescent electric light circuits. This equipment is all of the Westinghouse make and is protected by four lightning arresters, also furnished by that company. From the transformers the currents are led to a switchboard set beside the high-tension board just mentioned,

tunnel. Beyond the reach of the tunnel, wires between buildings are in underground vitrified terra-cotta conduits made by the H. B. Camp Company, of New York. The wiring is carried on the outsides of the two dry-houses, in iron conduits. Wires passing through floors have heavy rubber insulation and are protected by armored conduits for 5 feet above the floor. Power feeders branching from the mains in the tunnel to the motors in the buildings are each controlled by a triple pole, quick double-brake switch of ample capacity for 50 per cent. motor overloads.

There are thirteen motors in the plant, mostly suspended from the ceilings, ranging from 2 horse-power to 150 horse-power each, and aggregating 707 horse-power. They are belt-connected to short shafts, from which the machines are driven by belts. Most of the motors, together with the pipes and wires, as far as possible, are placed in the basements for the sake of greater safety and cleanliness. With such a division of power the electrical method of distribution seemed particularly well adapted to the needs of these works. The mo-

engines of the heating and ventilating systems, and for steam pumps connected with the water-supply and fire-protection systems, and the boiler feeds. For these various purposes the steam will be distributed at two pressures, 125 pounds and 80 pounds per square inch.

Excepting the portion used in the power-house, the steam will be transmitted through a 6-inch high-pressure and an 8-inch low-pressure main in the tunnel, and the drip will be returned through a 4-inch pipe also carried through the tunnel. When the presses are set up, another pipe will be run through the tunnel to return the steam condensed in them to the boiler room. Each steam main is anchored near the middle of the long straight run, and is provided with Manning expansion joints, besides long radius bends made of pipe at the right angle in the tunnel, which aid in caring for the expansion movements. The steam pipes were insulated by the Springfield Asbestos Company. Judging by the experience in New England and the South on which the design of these steam lines was based, it is expected that the drop between the boilers and the farther

ends of the lines will not exceed three pounds pressure. The exhaust steam from the engines driving the fans is passed through the coils of the heating apparatus, and the returns from these coils are dripped to Bundy return traps. A Bundy tank trap has been installed in the tunnel in each drip connection from the live-steam pipes. A Locke damper regulator has been placed in the boiler house to control the flue from the boilers to the chimney.

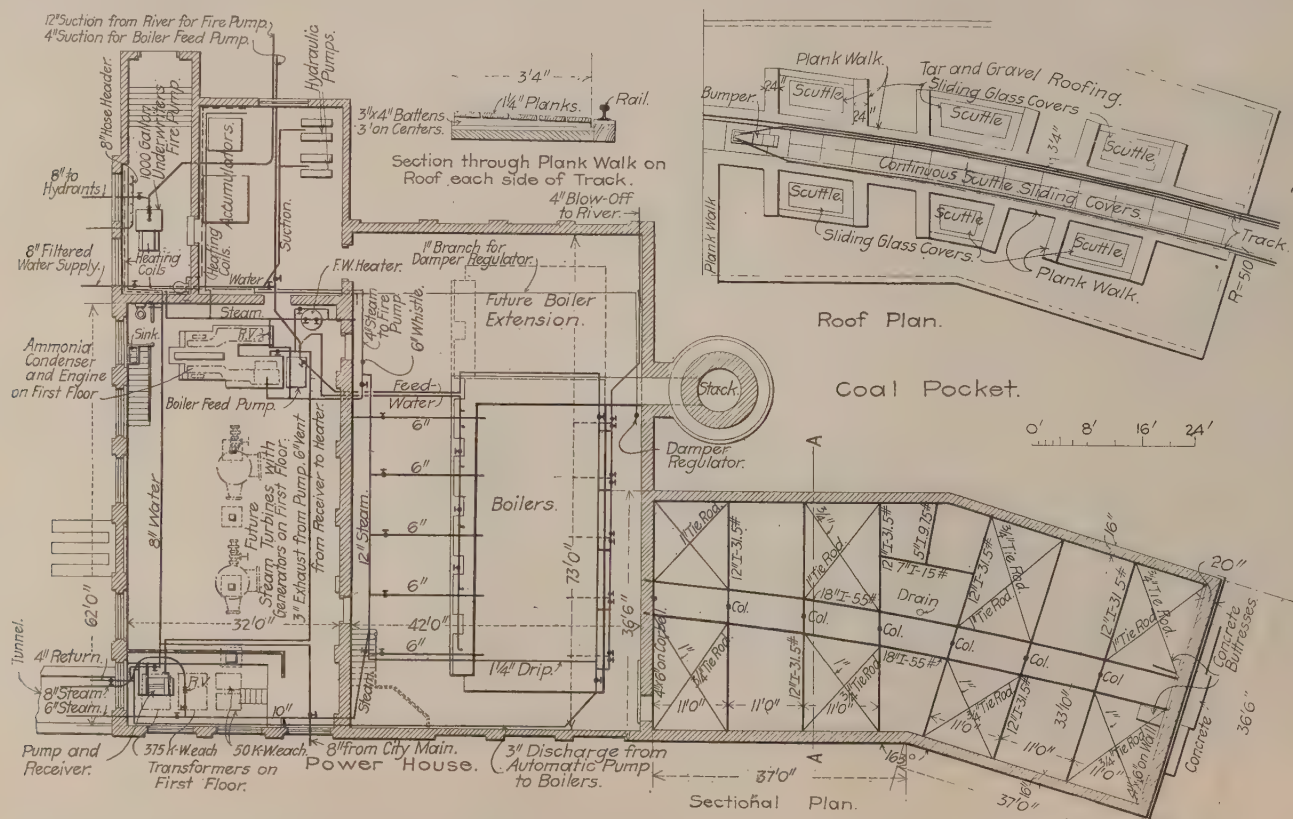
Pipe and Wire Tunnel.—One of the most interesting features of the works is the roomy concrete tunnel for pipes and wires, to which reference has already been made several times. This tunnel extends from the power house along the fronts of the basements of several of the principal buildings to the court between the sheeter building and the office, and then diagonally to the polishing building, as shown on the general plan, its total length being 800 feet. An accompanying drawing shows the cross-section with the positions of the pipes and wires. No stooping nor dodging is necessary in walking

are to be built across the tunnel so as to prevent the possibility of fire being communicated through it from one building to another, although there is and will be very little material inside the tunnel which will burn, unless inflammable gases or other combustibles should gain entrance by accident.

In addition to the steam and refrigerating pipes described in other paragraphs, there is in the tunnel a 1½-inch pipe carrying water under a pressure of 3,000 pounds per square inch for use in the hydraulic presses in the rolling building. The high-pressure pump for this service will be brought from the Newburyport plant and installed in the power house. An Akron pipe sewer is also run through the tunnel, in the position shown, to carry off the wastes from the sanitary plumbing and the manufacturing. At its beginning at the power house end the sewer is on top of the tunnel floor, but in its run of 800 feet it drops 4 feet, passing beneath the floor. The portion above the floor is encased in concrete, as indicated in

supply pipes. To furnish large quantities of water for fighting a fire in any building a belt main of 8-inch and 10-inch cast-iron pipes has been laid around the works, as shown on the general plan, supplying twelve double-outlet hydrants advantageously placed. Each hydrant is covered with the standard light wooden house containing three 50-foot lengths of 2½-inch Underwriter cotton hose with a 1½-inch play pipe attached.

Branches are taken from the 10-inch main into the building to supply the sprinkler systems; these branches are controlled by post indicator gates close to the main. Most of the buildings have automatic sprinklers, those in the vaults and the scrap storage building being on dry pipe systems. The sprinkler system in each building is provided with an automatic alarm bell and a mechanical gong, and the location of a fire will be indicated at the office and the power house by this apparatus. There is also a connection with the city fire department signal system, so that an alarm is given at the



Plan of the Power House, Boiler House and Coal Pocket of the Fiberloid Works.

through, and there is ample room for the workmen to use long wrenches when installing or repairing any of the pipes or wires. The walls are 18 inches thick and stand on footings 2½ feet wide. The roof is of concrete arches between transverse steel I-beams 8 feet apart on centers in front of buildings, and 4 feet apart in the spaces between buildings, where heavy loads may be brought upon the roof at the driveways. Between the beams the concrete is 6 inches thick and reinforced with expanded metal.

There are ten light wells 2x6 feet inside built up from the tunnel roof to a height of about 3 feet above the surface of the ground, as indicated on the cross-section. The covers of these wells have semi-prismatic lights, and each well has a screened pipe for ventilation. The floor is sloped slightly to drain inlets, and is a 2-inch layer of concrete placed on the earth. The outside walls and top are covered with two heavy coats of asphalt. A few brick fire walls

the cross-section of the tunnel, and an agricultural tile drain was laid beneath the part under the floor, to carry off ground water. The sewage is discharged into the river at the downstream end of the property. Practically all of the piping, excepting that for the refrigerating system and the automatic sprinklers, was done by the Walworth Construction Company, of Boston, under one contract.

Water Supply and Fire Protection.—The company is fortunate in having at the doors of this plant two independent sources of water supply of ample capacity, as indicated earlier in this article, a 30-inch main of the city water-works passing along the front of the yard, and the Chicopee river bounding the property on the other long side. An 8-inch connection has been made with the 30-inch main, which is here under a pressure of about 90 pounds per square inch, at each end of the yard, so that city water can be admitted to the fire-protection system, to the boiler feeds, or to the general water-

Indian Orchard fire station simultaneously with that given at the works. The sprinklers, which are of the Grinnell type, were put in by Messrs. H. G. Vogel & Company, of New York.

Ordinarily river water will be used for all purposes, being taken at two inlets. At the upstream inlet, opposite the power house, there are two cribs. From one a 12-inch suction pipe 95 feet long leads to a 1,000-gal. Blake duplex Underwriters' fire pump, installed in a separate room in the basement. From the other crib a 4-inch suction pipe leads to a Deane boiler feed pump in the engine-room basement. For general use in the buildings the water is to be filtered. This supply is drawn from the downstream inlet through an 8-inch pipe 99 feet long to a mechanical filter equipment of 600,000 gallons capacity per day, which has been placed in the basement of the machine shop. The filters and their appurtenances were installed by the Norwood Engineering Company, of Florence, Mass.

There are three filter beds, each 9x10½ feet inside, a sedimentation basin 9x29 feet, extending across the rear ends of the filters, and a filtered-water reservoir beneath the filter tanks. A No. 5 Lawrence Machine Company's centrifugal pump, with 6-inch discharge, draws the raw water from the river and puts it into the sedimentation basin, and a second pump of the same size and kind takes the filtered water from the reservoir and forces it through the distribution pipes. These pumps are driven by belts from the machine-shop motor. Alum and soda are used as the coagulants. The general arrangement of the filter equipment is shown by accompanying drawings. The air and strainer systems are of the same type as those used in the Watertown (N. Y.) municipal filtration plant recently described in this journal. The water supply for the acid building is taken through lead-lined iron pipes, made by the Lead-Lined Iron Pipe Company, of Wakefield, Mass., in order to avoid rust, which would be particularly objectionable in the fiberloid materials. Chapman valves are used in the various systems of water piping, excepting the automatic sprinkler systems, in which Eddy valves have been placed.

Refrigerating, Cooled Air and Cooled Water Systems.—At certain stages in the manufacture of fiberloid it is necessary to cool the machinery

coils containing 1,140 linear feet of 2-inch pipe, suspended close under the ceiling. The coils are 8 inches apart vertically and the pipes in each coil are 15 inches on centers. The room is 10 feet high, and on stacks of shelves reaching nearly to the pipe coils, cakes of crude fiberloid can be placed to be cooled from 60 degrees to 32 degrees in twenty-four hours, losing at the same time some of their moisture.

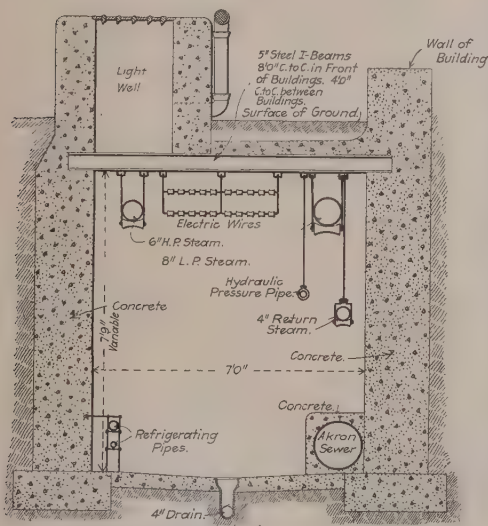
The refrigerating room is thoroughly insulated. Across its easterly end there is an anteroom 5 feet 4 inches wide to prevent direct communication with the outside air when the entrance doors are open, and at the northwesterly corner of the room there is a small square anteroom guarding the door into the adjoining sheet machine room. The outer brick walls have 2-inch air spaces and their inner faces are pitched to prevent the passage of air and moisture. Inside the brick walls are two linings of double thicknesses of ¾-inch matched boards with insulating paper between, forming two more air spaces. Similarly there are two false ceilings of the same construction, making three air spaces under the roof.

In the basement of the sheet machine building there are two steel tanks for cooling water; one is

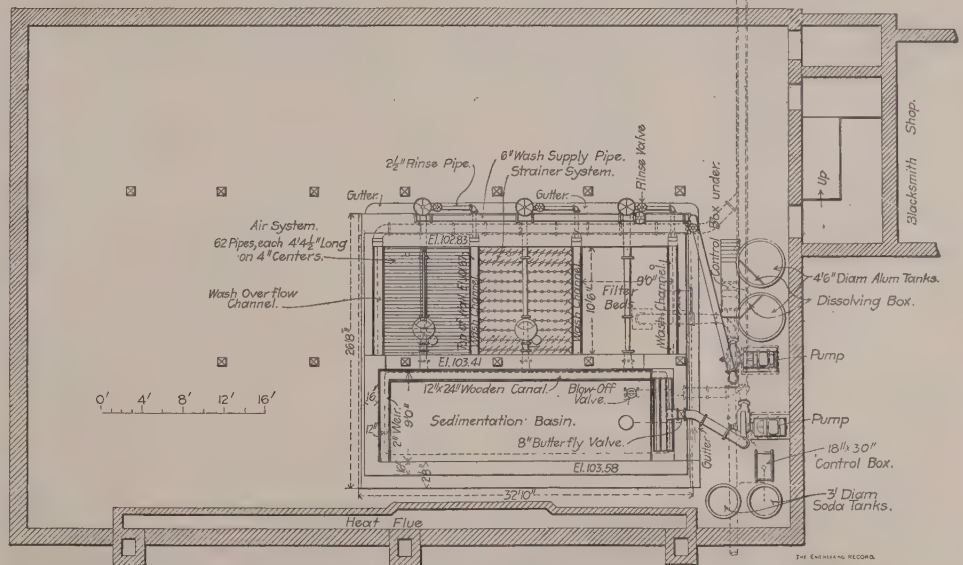
ing water to them by lessening the head in the standpipe and thereby closing the by-pass.

The temperature of the air in the sheet machine room must be maintained constant the year round. This is accomplished by means of a bunker in the basement, containing coils of ammonia pipes, with a 60-inch Sturtevant fan at one end and a heater at the other. In cold weather low-pressure steam is run through the heater pipes and the air is drawn through this end of the bunker, but in warm weather liquid ammonia is circulated through the pipes in the bunker. The air at proper temperature is forced through brick and galvanized-iron ducts and flues to various points in the room and is used over and over, being circulated by the fan. The contents of the room are 63,200 cubic feet. There are 1,320 feet of 2-inch direct-expansion ammonia pipes in the bunker. All the ammonia pipes and joints furnished for the plant were tested to 1,000 pounds pressure at the shops before shipment.

Heating and Ventilating.—Three or four of the buildings require provision for removing noxious fumes and supplying fresh air, and in one or two buildings there are special features in the warming apparatus. The system in the



Cross-Section of Pipe and Wire Tunnel.



Plan of Water Filters in Basement of Machine Shop.

and the partially finished product. Cooling is required in the rolling, sheet machine and polishing buildings, and is effected by means of an ammonia refrigerating machine, systems of pipe for circulating cold water and ducts for cooled air, in addition to the ammonia pipes. A 20-ton refrigerating machine, comprising a single-cylinder 12x24-inch Corliss engine, direct-connected to one 9x18-inch double-acting horizontal ammonia compressor, and the necessary storage tanks, has been installed in the power house by the De La Vergne Refrigerating Machine Company, of New York, which also put in the ammonia piping to the sheet machine building, the tanks for cooling water and the bunker for cooling air in the basement of this building. These ammonia pipes have the unusually long run of 680 feet, mostly through the tunnel. The liquid ammonia pipe is 1 inch in diameter, and the return suction pipe for the ammonia vapor is 2 inches, the latter being covered with "Monarch" insulation.

Across the southerly end of the sheet machine building there is a refrigerating room about 20 feet wide, in which a temperature of 32 degrees Fahrenheit is to be maintained by the direct expansion of the liquid ammonia through two

14 ft. long, 7 ft. wide and 6 ft. high, and the other is 14 ft. long, 12 ft. wide and 6 ft. high. They are connected together as one tank and supply cooled water to 13 jackets in the polishing building, 16 in the rolling building and 16 in the novelty building. In both tanks the water is cooled by coils of direct expansion pipes over which it is made to flow in a thin film, whence it passes to the machines to be cooled, being circulated by a power pump located near the tower. In the main between the pump and the several branches leading to the apparatus to be cooled is erected a standpipe of 6-in. wrought-iron pipe 24 ft. high. The pump is by-passed by a pipe leading direct from its discharge to the return pipe from the jackets to the tanks. Beyond this, in the discharge pipe, is a check valve to maintain a head in the standpipe when the by-pass is open, and in the by-pass there is a pressure regulator. Its pilot pipe connects with the standpipe and is adjusted to open at a certain head in the latter. This arrangement allows the cooling water to circulate constantly over the cooling coils in the tanks, whether it is flowing through the jackets or not. It is only necessary to open one or more valves at the jackets to divert the cool-

rolling building has some features worth mentioning. Fresh air is drawn in at a basement window on the east side and through a concrete duct beneath the basement floor to a 13x23-foot fan room at the center of the building. After being filtered through cloth and heated by low-pressure steam coils, the air is forced by a 5-foot fan into a 3x2½-foot concrete duct also beneath the basement floor, which extends to the west wall and then branches, following the wall in both directions. The hot-air duct feeds four brick flues built against the outside of the wall and one inside riser, from which the heated air is admitted to the rooms through 14x14-inch openings placed about 8 feet above the main floor. Alternating with the warm-air flues are four others containing vents through which the air may escape from the room.

Dust and fumes are removed from the immediate vicinity of each set of rolls through a galvanized-iron goose-neck duct. These ducts are connected in pairs to down pipes, which, in turn, are connected to a horizontal duct beneath the main floor. There are two systems of these exhaust ducts, one along the east and the other along the west side of the building, the latter being the longer. Each system is served by a

70-inch exhaust fan located in the basement, with 28-inch inlet and 26-inch discharge pipes, the discharge pipe ending at a basement window in each case. The fans are driven by belts from the power motors. The temperature is to be maintained at about 70 degrees, the air being used over and over.

The other factory buildings are heated and ventilated from two main sets of apparatus, one installed in the acid building and the other in the sheet shipping building. As in the rolling building, fresh air is drawn from the outside, filtered, warmed by low-pressure steam coils and circulated through underground brick ducts to the various buildings. At each building vertical flues built into or against the walls provide passages for the air to the different rooms, which it enters at a low velocity through openings fitted with dampers and registers. In each of the three sets of apparatus there is a three-quarter housing fan for circulating the air. These fans are in the basements of the buildings mentioned and are driven by direct-connected engines. In the two dry-houses there is special apparatus for drying the sheets of fiberloid. In the sheeter building constant temperatures are maintained in different rooms by apparatus described in another paragraph.

The office building also is warmed and ventilated by a fan-pressure system giving about six changes of air per hour. There is an extensive layout of double galvanized-iron ducts under the main floor, one set of ducts conveying hot and the other tempered air from the fans. Fresh air is drawn from the outside through a basement window and filtered, and the air in the offices is returned to the fan room through a 28x32-in. return register in the floor of the general office nearly over the fan room, a 32x18-in. wooden duct forming the connection. The temperature is automatically controlled by a thermostat. All the heating and ventilating apparatus was installed by the B. F. Sturtevant Company, of Boston. All the smaller buildings are provided with mechanical heating and ventilation. During the last severe winter the system had a thorough trial and proved satisfactory.

Both engineering and architectural features of this plant were designed and its construction has been supervised by Mr. Fred Sumner Hinds, of Boston. The H. P. Cummings Company, of Ware, Mass., were the general contractors. Mr. Julius Levine, of New York, is the president of the Fiberloid Company; Mr. George W. Tapley is vice-president; Mr. Silas L. Kenyon is treasurer and manager, and Mr. F. C. Lovejoy, of Newburyport, is secretary. Mr. Frank O. Lovejoy is the superintendent. The officers named and Mr. J. D. Parsons constitute the directors.

THE MUNICIPAL PLANT at Jacksonville, Fla., furnished 2,849,325 kw. during 1903, according to the report of Mr. R. N. Ellis, superintendent. The total expense of operation, including 5 per cent. interest and 5 per cent. depreciation on the total cost was 3.07 cents per kilowatt. The city pays the rates of private consumers.

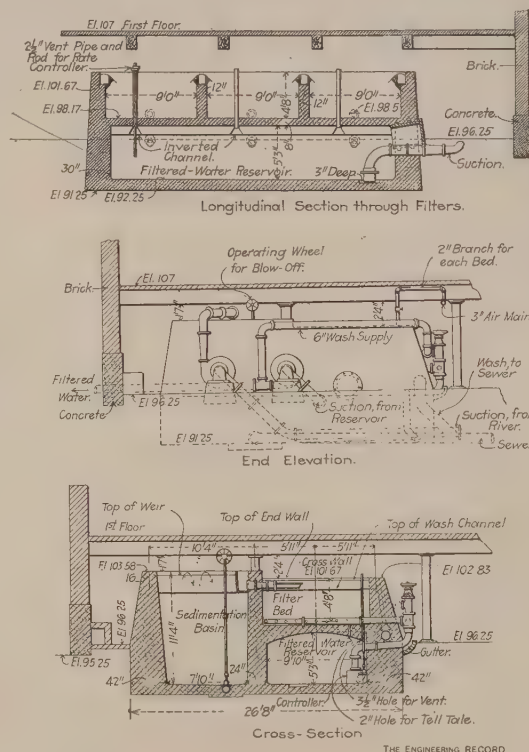
Cost-Keeping.

At the last meeting of the Engine Builders' Association of the United States, Mr. C. M. Lauer made a number of suggestions concerning cost-keeping that took up the subject in a rather unusual manner. After outlining briefly the classification of the overhead expense or burden into payments for indirect labor, interest, depreciation, insurance, taxes and repairs, he stated that the distribution of this expense is one which makes or mars a cost system. It may be done with such a degree of refinement as to make the expense of the work prohibitory; or it may be done in such a slipshod manner as to make it of little or no use to the manufacturer. The common form of making this distribution is to find from the previous year's accounts the sum of all the items that make up the burden, and after this has been determined to find the ratio between it and the sum of the direct labor for the same year. Then for each dollar expended for direct labor there is added an amount sufficient to

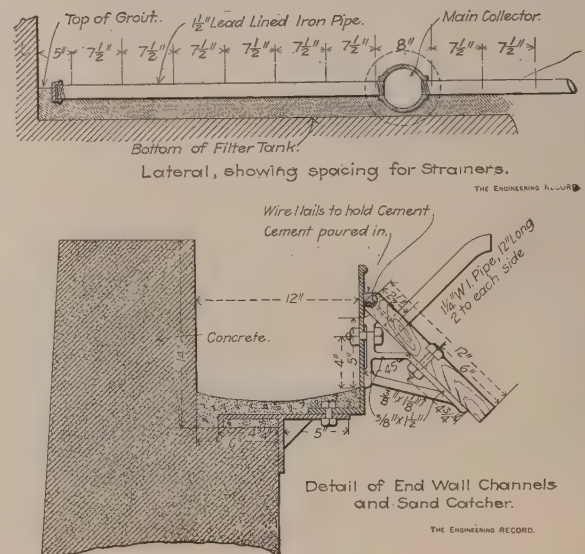
There are certain expenses incidental to the running of a manufacturing business which are clearly chargeable to the men and others to the machines. For example, heat and light are necessary for the men, while the power is consumed by the machines. All of these items are not so easy to divide. For example, the buildings are necessary for both men and machines, but there is a philosophy in all of this which enables a classification to be made of the burden and by this means to divide it into a man-hour burden and a machine-hour burden, and in this way distributes it on the produce in a just and proper way.

The principal use of costs is to enable the manufacturer to properly figure on new work and to enter competition with a knowledge that the prices quoted are based upon stable information. What is more disturbing than to enter a competition for business at a price which you are sure is correct and then find that one of the competitors takes the business at a figure which is below your cost price. This is the result of one of the following causes: Either your cost accounting or that of your competitor is in error, or your shop practice is bad as compared with his.

Times arrive when business is slack and it is a desirable thing for the manufacturer to take work at a small margin of profit, or perhaps at exact cost, in order to preserve his organization. This cannot be intelligently done if his cost



Details of Water Filters in Basement of Machine Shop, Fiberloid Works.



cover the burden in the form of a percentage. Such a method Mr. Lauer considers in error for more reasons than one. In the first place the percentage of burden has been fixed upon the results of the previous year's business and this results in an error which is perpetual. The percentage of burden fluctuates from year to year and from month to month; the organization must be maintained through periods of business depression as well as in times when work is plenty. It is obvious that a percentage fixed as described can only take such conditions into account in an approximate way. The great shortcoming of the percentage method is that it totally ignores the time element. The burden properly chargeable against a given tool is twice as much for two hours as for one, and yet if a job were done to-day by a man earning 20c. per hour, and to-morrow by a boy earning 10c., the boy using the same machine, but consuming twice the time, the amount of wages would be the same and hence the burden also. This is wrong, since the boy used the machine twice as long as the man.

system is defective and does not properly record facts. The factors then which must be taken into consideration in connection with cost accounting are: First, material; this requires intelligent direction of purchase and receipt of materials, stores accounting and stores issue. Second, labor; here proper safeguards must be provided against fraud on the part of the workmen. Wage rates, both day and piece, must be properly accounted for and charged. Third, the burden or overhead charges must be properly collected and distributed on the product, thus showing costs at their proper level. Finally, the facts in connection with these three items must be carefully deducted, collected and combined as the best guide for future action, is the experience of the past.

OIL AS FUEL FOR COKE OVENS is used by Mr. S. F. Barnes, of Holyoke, Mass., with steam generated in a return bend of cast-iron pipe of 7/8 in. diameter and 1-in. walls, set in the bottom of the furnace and supplied with water from the city mains.

The Revised Plans for the Purification of the Pittsburg Water Supply.

The authorities of Pittsburg have for a second time approved plans and specifications for works for purifying the water supply of the city, and contractors are now figuring on the work. The original plans completed three years ago were described in *The Engineering Record* of January 25, 1902, and the conditions leading to their modification were outlined in the issues of September 19, 1903, and March 5, 1904.

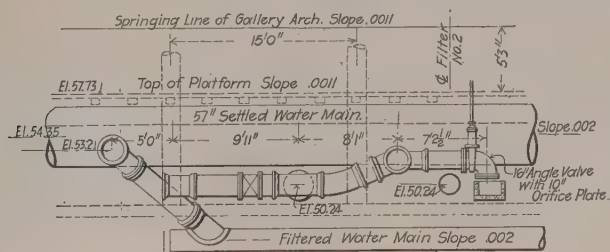
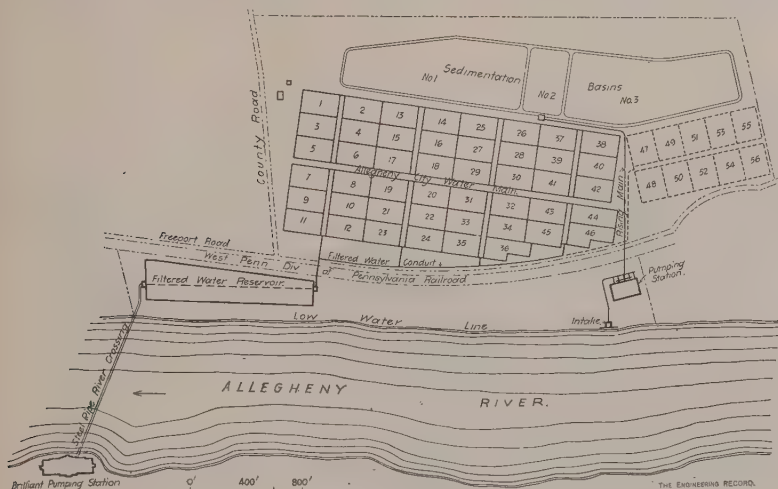
The recently completed plans are practically new ones, as the essential features of the plant, as now projected, are greatly changed from those outlined in the original design. The present plans provide for 56 filter beds of 1 acre each, 46 of which are to be built immediately. A pumping station on the north side of the Allegheny River will elevate water from that stream to two large sedimentation basins from which it will flow by gravity through the filters to a covered filtered-water reservoir. From this reservoir the water will pass in two

The river is navigable at this point, and a dam and locks, which the War Department is now constructing just below the site, will give an additional depth of about 6 ft. The West Penn division of the Pennsylvania Railroad lies near the southern edge of the proposed location of the filter beds, between them and the pumping station, which is within a short distance of the tracks. This division has been connected with the Allegheny Valley division and the main line of the Pennsylvania Railroad by the recently completed Brilliant cut-off and bridge and, together with the river, will furnish the plant with excellent transportation facilities. The bed of the river is composed of sand and gravel which can be used in the concrete that is to be employed exclusively in the masonry construction. The sand, after being screened, can possibly be used in filling beds when they are completed.

There are many features of the design which distinguish it from other plants in this country. Among the most noticeable of these are the covered galleries between the rows of filter

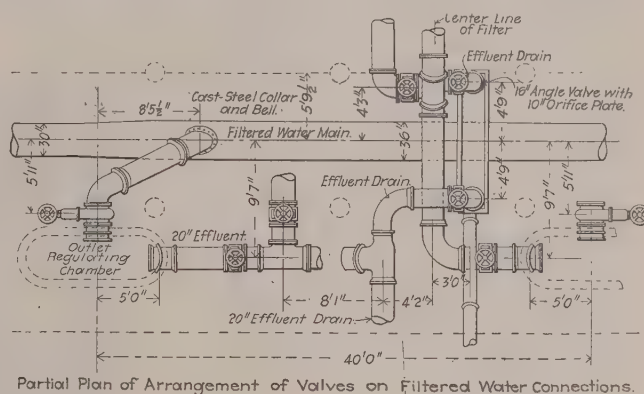
an intake chamber, which is designed to settle out the heavier deposits. A pressure main from the pumping station is laid across the tops of the conduits and connections with it provide for flushing them. The intake chamber will be cleaned by an impeller sump pump. Two 6x9-ft. sluice gates control the flow from the chamber to a concrete conduit, which leads longitudinally the length of the pump pit beneath it, and is connected directly to the suction of each of the raw-water pumping units.

There are to be four horizontal-shaft, single-stage, double-suction, centrifugal pumps, each direct-connected to a vertical compound condensing engine. Each unit is to have a capacity of at least 35,000,000 gal. in 24 hours when pumping against a total head of 60 ft., and a capacity of at least 55,000,000 gal. against 30 ft., with proportionate capacities for intermediate heads. Provision is made for the addition of a fifth pump of the same size and capacity of these four. The water for washing the filter sand and for the high-pressure system, which is designed for the plant, will be furnished by

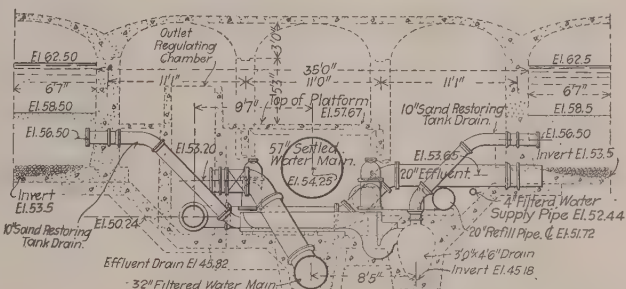


Sectional Elevation looking East at Filters 1-2.

General Plan of the Pittsburg Filtration Plant and Details of the Covered Galleries between the Filter Beds.



Partial Plan of Arrangement of Valves on Filtered Water Connections.



Sectional Elevation of Filtered Water Connections at North End of Gallery.

steel pipes on the bed of the river to the Brilliant pumping station, which now draws directly from the river, and be elevated from it to three distributing reservoirs. A main which will connect one of these reservoirs with the distribution system of that part of the city on the south bank of the Monongahela River, is also included in the plans.

The plant, as proposed, is one of the largest in the world and is to be built on a site on the north bank of the Allegheny River, which is particularly well adapted to its location and construction. The valley of the river is quite rugged on both banks for some distance above its mouth, but just opposite the present pumping station a practically level area, about 1 1/2 miles long and from 1/4 to 1/2 mile wide, intervenes between the river and the hills. The tract is several feet above the highest flood level in the river, and is covered with a sandy loam, varying from 8 to 12 ft. deep, underlaid with gravel, below which, at a considerable depth, is solid rock.

beds, the exposed piping in these galleries, the permanence and general arrangement of the sand-washing apparatus, the heating and ventilating of the galleries and the filters, which are also covered, and the method of controlling the operation of the entire plant from one centrally located administration building.

Pumping Station.—The pumping station building is to be a one-story brick building, 128x200 ft. in plan, with a longitudinal wall at the center, which divides it in two rooms, one for machinery and the other for the boilers. The raw-water pumps are placed in a pit, 28 ft. wide across the south end of the building, with its floor 16 ft. below that of the remainder of the room. An electric generator set, wash water and pressure system pumps, a machine shop and an office are placed on the higher floor of the room. The floor of the other room is at the same elevation as that of the main floor of the engine room and contains the boiler plant.

The intake consists of eight 48-in. reinforced concrete conduits leading from the river into

one 3,000,000-gal. and two 5,000,000-gal. direct-acting plunger pumps.

Direct current will be furnished by three engine-type three-wire generators having a capacity of 175 kw. when running at 250 r.p.m. Each generator is direct-connected to a vertical cross compound condensing engine. An arc light generator furnishing 6.6 amperes at 5,000 volts is also to be included in the engine room. It will be direct-connected by a flexible insulating coupling to a motor driven by current supplied by the main generator set.

The remainder of the machinery room contains the condensing apparatus, boiler feed pumps, water supply and circulating pumps, a complete machine shop equipment, and various appurtenances and auxiliary machines. A 62-ft. span traveling electric crane is to be placed across the engine room. Steam will be furnished by eight 350-h.p. water-tube boilers arranged in four batteries. They are designed for a working pressure of 160 lb. They are to be furnished with chain or traveling link

stokers to burn Pittsburg bituminous slack coal. Two fuel economizers are placed in the central transverse space between the two pairs of batteries. The use of economizers is a departure from the usual design of power plants in the Pittsburg district and the general equipment of the plant is designed for more economical coal consumption than that of most plants in that locality.

Sedimentation Basins.—The raw-water centrifugal pumps discharge in one common 96-in. riveted steel riser main which leads to the gatehouse at the south side of the three sedimentation basins. These basins are placed on slightly rising ground north of the filter beds, as shown in the plan. They cover an area of $27\frac{1}{2}$ acres, being 530x2,920 ft. in extreme dimensions, and will be built partly in excavation and partly in embankment. The combined capacity of the three will be about 130,000,000 gal., which is about the maximum daily capacity of the filters when they are operating at the normal rate.

The central basin is much smaller than the other two and will serve as a receiving basin. The outlet from the gate chamber is a large bellmouth of reinforced concrete, which merges into a rectangular reinforced concrete conduit that passes through the embankment of the receiving basin and extends across on its bottom to the opposite end. This conduit is 12x12 ft. in dimension at the entrance to the basin, and is gradually reduced to 4x4 ft. at the opposite end. Openings in its flat top permit the flow of water into the basin.

The outlets from the receiving basin to the sedimentation basins on either side of it are four 4-ft. circular reinforced concrete conduits. Gate chambers built in each of these conduits contain flanged gate valves operated from the surface. The receiving-basin ends of these conduits are turned up in order that the flow may be drawn vertically into them. Seven-foot reinforced concrete conduits lead directly to each sedimentation basin from the gate house and are laid along the inlet ends of the basins in order that water may be turned directly to either of the end basins in case it is desired to throw the receiving basin out of commission. The outlets from the receiving basin end in the conduit inlets from the gatehouse, and the water in any case is admitted to the larger basins through holes in the tops of these conduits, at an elevation of about 10 ft. above the bottom of the basins.

The outlet arrangements were designed to permit the variation of the level of the water in the basins as the turbidity of the raw river water varies and are practically the same in both of them. The water is drawn from the end of the basins opposite the inlet end. Twenty-eight 15x24-in. reinforced concrete channels, with their tops covered, are spaced at intervals across the end of the embankment. They are placed vertically in the face of the slope of the embankment and have three 24x24-in. openings on their water side. The top opening has its center 14 ft. above the bottom of the basin, the center of the middle one is 3 ft. lower, and the center of the bottom one is 2 ft. further down and 9 ft. above the bottom of the basin. The top opening has no cover. The other two will be covered by a sheet-iron plate, which is hinged along its upper side to the inside of the concrete cover and opens inward. They are operated by separate iron rods extending to the top of the channel. The vertical channels are each connected at its lower end by an iron casting to a 5-ft. reinforced conduit. These conduits, after passing through the embankments at the corners of the basins, turn and parallel the filter beds along the upper side.

The loam and soil under the embankments of

the receiving and sedimentation basins and at the low places under the filters will be stripped. The banks will be of the best clayey and gravelly material obtained in the excavation. Alternate 3-in. layers of each will be placed and thoroughly mixed and rolled in 6-in. layers.

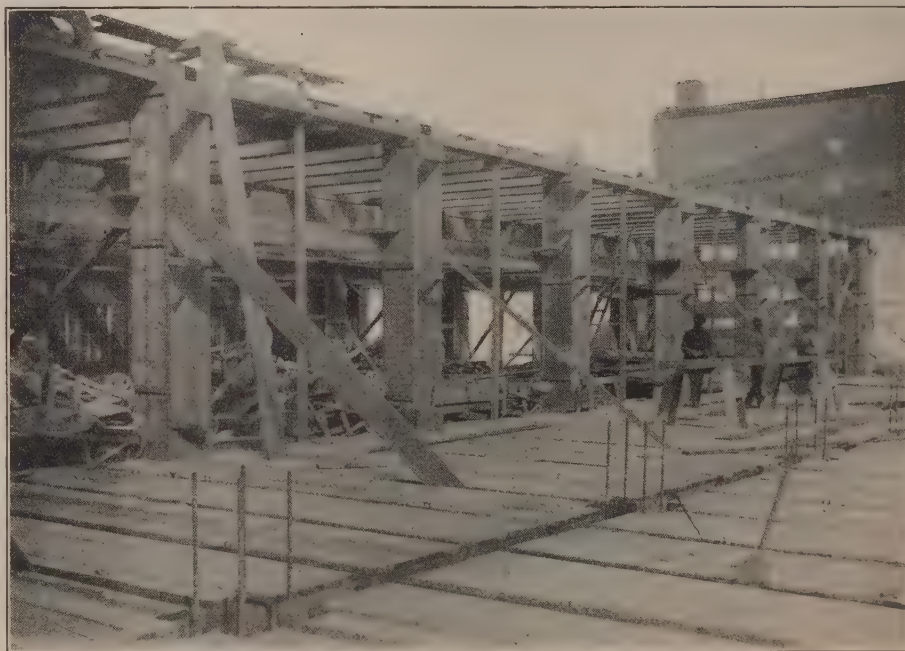
Filter Beds.—The 46 filter beds are each one acre in area, and each is operated independently of the remainder of the plant. The general arrangement of the beds was largely determined by the existence across the site of the plant of a right of way, 18 ft. wide, of a 5-ft. steel riser main belonging to the Allegheny Water Department. It was impossible to obtain permission to do any grading in this right of way, so the beds had to be arranged on either side of it. Twenty-four of them are placed on the north side and the remaining 22 on the south. The beds are in groups of six each, three on either side of a 31-ft. covered gallery, which contains the entire piping system and valves that control their operation. The entrance to the galleries is at grade from a drive built through the plant over the right of way of the 5-ft. main.

Branch connections are taken from the con-

mentation basins. The first floor of this building is occupied by the machinery used in operating the gates in the chamber below. The second floor contains the offices of the superintendent of the plant and his assistants, the exchange board of a telephone system extending to various parts of the plant, a machinery room, a blue-printing and photographing room and a large storage vault. The top floor contains complete bacteriological and chemical laboratories for controlling the operation of the plant.

Telephone connections will be made between the superintendent's office in the administration building and the filter attendants' room in each of the covered galleries between the rows of filters. All samples of water taken for analysis from the filters by the attendant must be obtained through specially arranged patrol boxes at each filter, which automatically register in the superintendent's office the time the box is opened, and so prevent any manipulation of duty by the workmen.

The regulating valves on the inlet and outlet to each filter, the apparatus registering the rate of flow of water through the filters, the loss of



Molds for Columns and Floor, Bilgram Building.

crete conduit which leads along the north side of the filters from the outlet ends of the sedimentation basins. These branches enter each gallery and extend their length with side connections to each bed. The water passes through these side connections and through inlet controlling valves to the interior of the filters, entering just above the normal sand level at the upper corner adjoining the gallery. The water then passes down through the filtering material and is collected by the underdrainage system and conveyed by it out of the bed to the outlet regulating chamber located in the gallery near the center of the bed. From this chamber the water enters a filtered water main that runs longitudinally the length of the gallery and connects with the main filtered-water conduit along the south or lower edge of the plant. This conduit crosses under the highway and railroad at the western end of the site and enters the inlet gate chamber of the filtered-water reservoir.

A three-story administration building is built over the chamber containing the gates which control the operation of the receiving and sedi-

ment basins, etc., are to be automatic in their action, but changes in the rate of passing water through the sand, throwing a bed in or out of service, and similar operations require the changing of these automatic devices by hand. The duties of the filter attendant will be the same as in most plants, and he will report several times a day to the office of the superintendent the general condition of each bed.

The ventilation and heating of the galleries and filters is to be done by a fan and steam-heating coils in each gallery. The steam will be supplied from the pumping station by an underground main, with a distribution system in each gallery. An outlet is provided in the roof at the end of each gallery, opposite from the end containing the fan, to insure circulation in case the fan is operated when the entrances to all the filters are closed, but the intention is to use the fan only when a bed is being cleaned.

The only entrance to the beds from the galleries is through a hydraulically operated 7x5-ft. sluice gate. The only ventilation is through thirteen 2-ft. manholes in the roof of each acre bed, and these will be closed when the bed is

in operation. When a bed is to be scraped the water will be drawn off, the ventilators in the roof and the sluice gate entrance from the gallery opened and the ventilating fan started. When the temperature and humidity of the air in the bed has been sufficiently improved, the scraping work will be commenced and the fan kept in operation so long as it is necessary to maintain a reasonable condition of temperature and humidity.

The galleries and the beds will be lighted by incandescent electric lamps. The lights in the beds are arranged in circuits so that only the part in which the scraping or other work is being done need be lighted. A row of lights from the back end of the bed down one bay to the entrance will always be lighted, while work in the bed is in progress, to serve as a pilot to the entrance. The galleries are provided with skylights in their roofs, but artificial light will usually be required in them.

The covered galleries between the beds will greatly facilitate the scraping of the surfaces of the sand beds and the washing of the dirty sand. The sand washing and scraping apparatus differs from the usual arrangement in its

machine distribution, through a connection between the machine and the tank.

The sand washing water and the water for operating the ejectors is to be supplied at 100 lb. pressure at the beds by the three reciprocating pumps in the pumping station. It will be conveyed by a 30-in. steel pipe, laid down the drive, which extends the length of the plant. Twelve-inch branch connections are extended from this main to the half galleries on either side of the drive, and connections are made with these branches to piping systems suspended from the roofs of the galleries. The piping in the beds lead from these overhead gallery systems and will be steel pipes permanently suspended from the roofs. These pipes will supply the water for driving the ejectors, receive the discharge from the ejectors and deliver it to the sand washers in the gallery and serve as conveyors for the sand that is to be returned to the beds from the washers. The pipes in the beds are tapped at frequent intervals and provided with fittings for the flexible hose connections of the receiving tanks and ejectors. The whole system of sand washing water pipes is so arranged that sand may be

constructed of groined arches with a clear span of 15 ft. 9 in. between the circular piers which support it.

The concrete roof is to be covered with 3 ft. of soil, and the only entrance from the surface to the interior of the reservoir will be through a few ventilator manholes and a hatchway for the admission and removal of a boat. These will be closed and sealed under normal conditions, and the water in the reservoir will be entirely shut off from light and air, with the exception of air vents in the inlet gate chamber outside the walls.

The reservoir can be by-passed by a reinforced concrete conduit laid, longitudinally, along its bottom, from the inlet chamber to outlet chamber. A low concrete dam, placed lengthwise on top of this conduit, divides the reservoir into two parts to a depth of 10½ ft. The inlet and outlet regulating gates are so arranged that either half of the reservoir may be used separately, to the top of this low dam on the conduit, or the reservoir may be entirely used to its full capacity, or the filtered water may pass directly through in the conduit laid along the bottom.

River Crossing.—The water flows from the filtered water reservoir in two 72-in. riveted steel pipes, laid on the bottom of the river, to the Brilliant pumping station on the opposite bank. They end in a large, vertical cylindrical reinforced-concrete equalizing chamber in the station building. This chamber discharges in a horizontal conduit leading beneath the pump pit to which the suction of the pumps will connect. The additions to the equipment in the Brilliant pumping station will include two 15,000,000 gal. pumping engines, designed to work against a head of 365 ft., three 500-h.p. water-tube boilers, built for a working pressure of 100 lb. per square inch, stokers, coal handling machinery and the necessary flues and piping for the boiler room.

The pipe line leading to the south side from the distributing reservoir above the Brilliant pumping station is to be of riveted steel. The Monongahela River crossing will be the same kind of pipe protected by reinforced concrete. The decision to use protected riveted steel pipe in this line was made after it had been concluded to make an electrical survey of all the mains of the water supply system, and protect such parts of the system from electric currents as are at present subjected to them.

The proportions of the ingredients used in concrete in the different parts of the filtration plant and the pipe lines vary from 1 part of cement, 2 parts of sand and 4 parts of ballast to 1 part of cement, 4 parts of sand and 8 parts of ballast, measured in volumes. Wet concrete is to be employed throughout the work, and plastering is to be avoided to the greatest possible extent. All the ballast for the concrete in walls, gate chambers, trenches and miscellaneous concrete is required to pass a 2½-in. ring, and that for the concrete in the floors, vaulting and piers, such size that all will pass through a 1½-in. ring, while that for the concrete in curbing, conduits and regulating chambers must pass a 1-in. ring.

Special Contract Requirements.—Among the general provisions governing the work, the following extracts are from the specifications regarding the sanitary conditions to be observed during the construction: "Each and every dwelling, or building, used as sleeping quarters or occupied by employees or laborers engaged upon the work, shall contain at least 300 cu. ft. of air space for each and every occupant thereof. Each such building shall be 10 ft. high in its lowest part and shall be provided with a tight floor, which shall be raised upon supports and set at least 1 ft. from the ground. Each and



Molds for Columns and Saw Tooth Roof, Bilgram Building.

completeness and its permanent character. Alternative plans have been prepared for scraping the dirty sand from the surfaces of the beds and also for replacing it when the beds are cleaned. One of these is by hand and the other by machines. Three portable hydraulic ejectors, with their discharges connected to sand washers, two sets of which are located in each half gallery, will be provided in case the hand scraping is adopted.

The scraping machines are required to scrape, mechanically, the surface of the sand and elevate the scrapings so removed by a traveling belt or similar device to a hydraulic ejector on the carriage of the machine. The distributing machine is merely a traveling shuttle belt, which will distribute the sand over the surface of the bed. In case either the hand or machine method of distribution is employed, a receiving tank, operated on an overhead track system extending longitudinally down each alternate bay of the filter, will be employed. The sand will be placed on the surface of the bed from this tank, in case of the hand distribution, through openings in the tank, and with the

hydraulically transported from any bed in the plant to any other bed.

The wash water supply pumps are designed to draw either from the filtered water supply or from the sedimentation basins. The dirty wash water will be discharged into a system of reinforced concrete conduits connecting with the main drainage system of the plant, which has an outlet in the river downstream from the pumping plant intake.

Filtered Water Reservoir.—The filtered water reservoir is located on a narrow strip of land between the railroad tracks and the river at the southwest corner of the plant. This is the only available site, and owing to its proximity to the river the reservoir had to be designed with the danger from high water as a governing factor, and the river bank will be heavily protected to avoid trouble from this source. The basin has a length of 1,194 ft., a width of 294 ft. at the inlet end and of 168 ft. at the outlet end. The maximum flow line is about 25 ft. above the floor, and the maximum capacity will be about 45,000,000 gal. The floor will be inverted groined arches and the roof is to be

every camp for the housing of men and laborers shall be provided with a separate building to be used as a wash house or laundry, and also with a separate building constructed and set apart for use as a kitchen or cookhouse. Each and every stable used for housing horses, mules, cattle or other animals employed on the work shall be situated at least 150 ft. distant from the nearest point of any dwelling, barracks or kitchen used by or for the laborers, or workmen, and storage and disposal of manure shall be properly cared for, so as to be sanitary and not unhealthy or unsightly."

"The contractor shall supply sufficient potable drinking water to all of his employees, but from such source or sources, only, as are approved by the director. Food, table and kitchen waste, or garbage and all such refuse, liquid or solid shall be immediately placed in a tight receptacle of sufficient capacity to keep the usual day's supply, and at least once in 24 hours all such waste shall be incinerated or burned, and thus thoroughly disposed of, so as not to create a nuisance."

"Sanitary conveniences for the use of all men and laborers employed on the work shall be constructed and maintained by the contractor in sufficient number, in such manner and at such points as may be approved by the director, and they shall be exclusively used by all workmen and laborers, and the sanitary maintenance of them shall be strictly enforced. These sanitariums shall be constructed on the septic tank principle, with tight container, and shall be properly arranged with flushing devices, so that septic action can take place, and the liquid running away shall be reasonably clear, colorless, free from disagreeable odor and entirely unobjectionable to run out to a water course."

"The contractor shall contract with one or more qualified medical practitioners for the medical and sanitary supervision of their employees and works, who shall have care of and inspect all dwellings, stables, sanitariums and works at least once a week and oftener, if the health conditions of any camps or such provisions require it, and supply medical attendance and medicines to all workmen and employees."

"The contractor shall furnish each week a list of all new men employed on the work, from the date of the previous list, and a properly certified statement or certificate by the medical officer in charge that each such employee has had a recent successful vaccination, and no man shall be employed upon this work in any capacity whatsoever without such certificate or without having been vaccinated at the time of his employment."

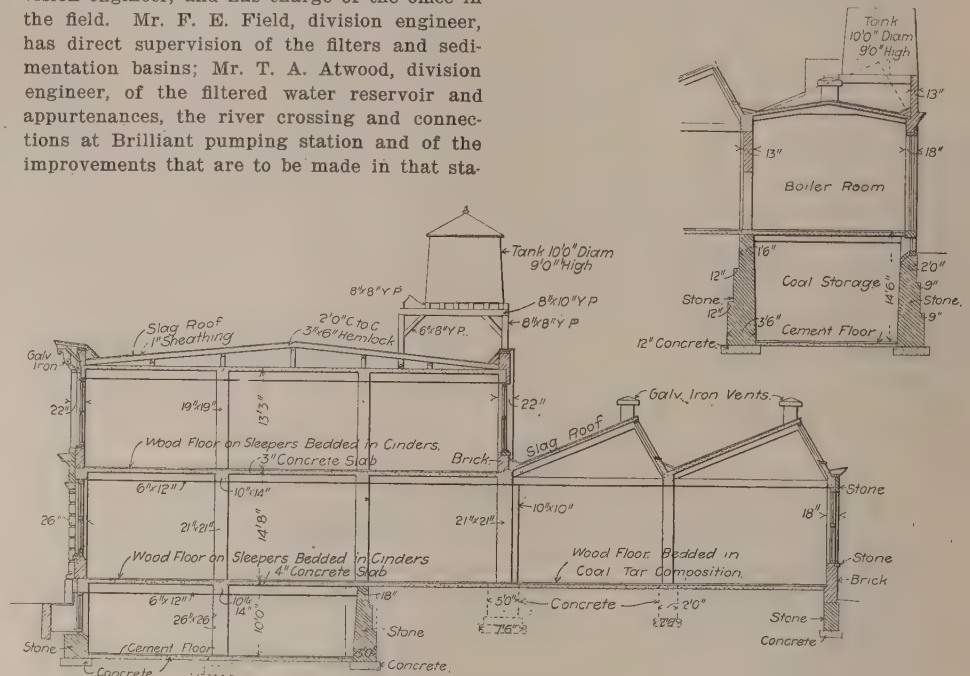
The removal of any person taken ill with a suspected contagious disease is also required, and the contractor is required to provide and establish a hospital or to contract with some hospital in the county for regular service. The contractor is further required to obey and enforce all other sanitary rules and take such precautions against infectious diseases as the director may deem necessary. The statutes of the State and the regulation of the State Board of Health governing the sanitary construction, management and control of industrial camps are considered a part of the contract.

The work of designing the plant and the improvements connected with it, and the making of the contract plans, which, according to the charter of the city, must be made in detail before bids are asked for or contracts let, have been done by the engineers and assistants in the Bureau of Filtration, a regularly established bureau of the Department of Public Works. The construction work will be carried on under the supervision of the same bureau. Mr. Ed-

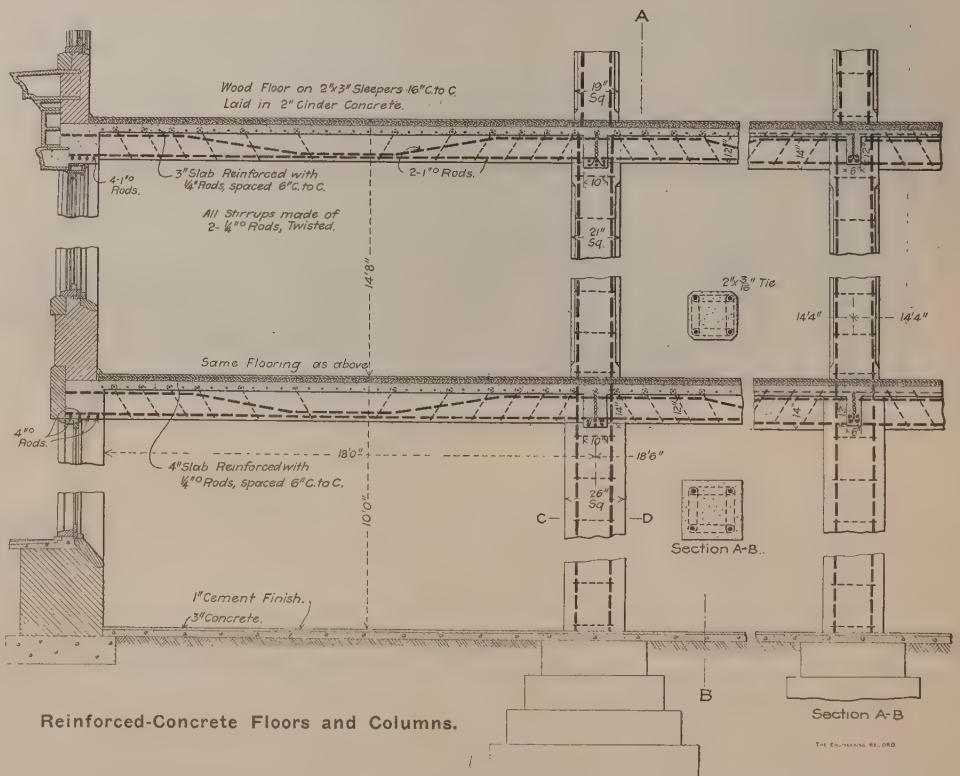
ward M. Bigelow is the Director of Public Works, and it has been due to his perseverance that the many obstacles which have been placed in the way have been overcome and the completion of the plant assured. Mr. Morris Knowles is chief engineer of the Bureau of Filtration. Mr. T. H. Wiggin is the principal division engineer, and has charge of the office in the field. Mr. F. E. Field, division engineer, has direct supervision of the filters and sedimentation basins; Mr. T. A. Atwood, division engineer, of the filtered water reservoir and appurtenances, the river crossing and connections at Brilliant pumping station and of the improvements that are to be made in that sta-

A Reinforced-Concrete Machine Shop in Philadelphia.

The Hugo Bilgram machine shop is probably the first building with its floor construction entirely of reinforced concrete that was erected for machine shop purposes in Philadelphia. It



Section of Bilgram Building.



Reinforced-Concrete Floors and Columns.

tion; Mr. F. H. Robbins, division engineer, of the low lift pumping station and its equipment, and Mr. N. S. Sprague, assistant engineer, of the pipe line to the south side.

THE TOTAL ELECTRIC LOAD OF LONDON connected to the services of the London public supply corporations is equivalent to about 6,800,000 lamps of 8 c.p., according to "The Electrician," of that city. The records appear to include 19 different supply undertakings.

is rectangular in plan, with a frontage of 120 ft. on one street and a depth of 100 ft. to a frontage on a rear street. The main front was designed to be 5 stories high for a depth of 53 ft., and the remainder of the structure to be one story in height. Of the five stories in the front part, only two have been erected; but provision has been made for adding the remainder of the building by laying the floor of the third story and erecting a temporary roof over it. The reinforced concrete floors and framing are

built on concrete footings and stone foundation walls, and are inclosed by brick walls trimmed with terra cotta.

The site is underlaid by gravel, and no difficulty was experienced in obtaining a good foundation, nor was there any trouble with ground water during the construction. A basement, 35 ft. wide and 10 ft. high in the clear, is built beneath the front part of the building, and has a cement mortar floor laid on a concrete base. A single row of reinforced con-

The second story is 13 ft. 4 in. in height and the third and fourth stories are to be of the same height; while the fifth story has been designed for a height of 12 ft. between its floor and the lower edge of the beams supporting the roof. The columns in the second floor are 19 in. square, and are spaced the same as those in the first floor. The columns in the third floor are designed to be 17 in. square, those in the fourth floor 13 in. square, and those in the fifth floor, which support the roof, will be 8 in.

dows, a few light partitions, and this flooring are the only woodwork in the building, and this was coated with silicate of soda paint to render it fireproof. The first floor is designed for a uniform live load of 300 lb. per square foot; the second floor for 200 lb. per square foot; and the remaining floors for 150 lb. per square foot.

The temporary roof over the second floor and the saw-tooth roof over the one-story part of the building were designed to carry a live load of 30 lb. per square foot. They are covered with 4 layers of Acme felt, each layer mopped with Diamond roofing cement and the whole covered with screened crushed slag from $\frac{1}{4}$ to $\frac{1}{2}$ in. in size.

The concrete work was designed and executed according to the De Valliere system by the Reinforced Cement Construction Co., New York, Mr. J. O. Ellinger, manager. Ballinger & Perrot, Philadelphia, Pa., were the architects of the building. The principal features of this system are the use of round bars, part of which in each beam are cambered from the bottom of the section to the top at the intersections with the columns, and the placing of patented twisted-rod hangers, which are designed to tie the reinforcing members together in such manner that the sections may be calculated as T-shaped rather than rectangular ones.

The centering and the molds were made of 2-in. dressed plank. One and one-half inches of concrete was first laid in the molds and thoroughly tamped. The straight bars were next laid with the twisted-rod hangers and then another inch of concrete was placed. The camber rods were next laid and held in place at their ends until the remaining concrete had been poured. One or two bays of beams were built each day, and the slabs laid over the same as far as the middle of the last girder. The reinforcing rods of the slab at the end of each day's



View Showing Molds for Floor and Saw-Tooth Roof.

crete columns, 26 in. square, placed longitudinally along the middle of the basement, on 14 ft. 4 in. centers, and with concrete footings, supports the first floor over it. The first story of the main building is 14 ft. 8 in. high. The one-story portion in the rear is covered with a saw tooth roof of two sections, one of 21-ft. 4-in. and the other of 22-ft. 1-in. span. This roof is built entirely of reinforced concrete, galvanized iron and glass, and is carried at each side and on the ends by the walls of the building, while a row of reinforced-concrete columns, 8 in. square, placed longitudinally on 14-ft. 4-in. centers, support it at the middle. This row of columns is connected together at the top by an 8x12-in. beam, which extends longitudinally the length of the building. The columns and this beam are braced laterally by transverse 8x12-in. beams extending from the tops of the columns and from the middle of the span between them to walls on either side. The roof is a 3-in. reinforced concrete slab supported on inclined 8x10-in. reinforced concrete beams, spaced the same as the horizontal transverse beams and built monolithic at their bases with those beams. Galvanized iron ventilators are placed at the peak of each tooth. The skylights have galvanized iron frames imbedded in the concrete; no wood was used in any part of the roof.

Three longitudinal rows of reinforced concrete columns, 21 in. square, on the first floor of the main building, support the second floor. The center line of the first row is 17½ ft. from the inside of the front building wall, the center line of the second one 18½ ft. from the first, and the third the same distance from the second and under the rear wall of the main building. The columns are on 14-ft. 4-in. centers, longitudinally, the centers of the end columns of each row being 2 ft. 5¼ in. from the inside edge of the outer wall.



Interior View of the Bilgram Building.

square, all spaced the same as those in the two floors that have been built. The columns in each row are connected at the top by longitudinal 10x14-in. reinforced concrete beams. The transverse beams supporting the floors are 6x12 in. on 3-ft. 7-in. centers. The space between the beams is covered with a reinforced concrete slab, 4 in. thick in the first floor and 3 in. thick in the upper floors. This is covered with 1¼-in. flooring nailed to 2x3-in. sleepers imbedded in the concrete. The frames of the doors and win-

work were made to project so as to engage the adjacent work on the following day. Straight spades and scrapers were used inside the forms to bring the sand and cement against their surfaces.

The concrete was mixed in the proportions of 1 part Alpha Portland cement, 3 parts clean gravel and 5 parts of broken trap rock of a size that would pass a ¾-in. ring. The mixing was done by hand. The building laws of Philadelphia required that maximum compressive

The New Well and Hydraulic Pumping Plant at Peoria, Ill.

Paper read before the Illinois Society of Engineers and Surveyors by Dabney H. Maury, Peoria.

Prior to the construction of the well and pumping plant to be described in this paper, the writer, as engineer for the Peoria Water Works Co., had already built for the company two hydraulic pumping plants. The earlier one, consisting of two duplicate pumping units installed in a well 3,340 ft. north of the main well, was

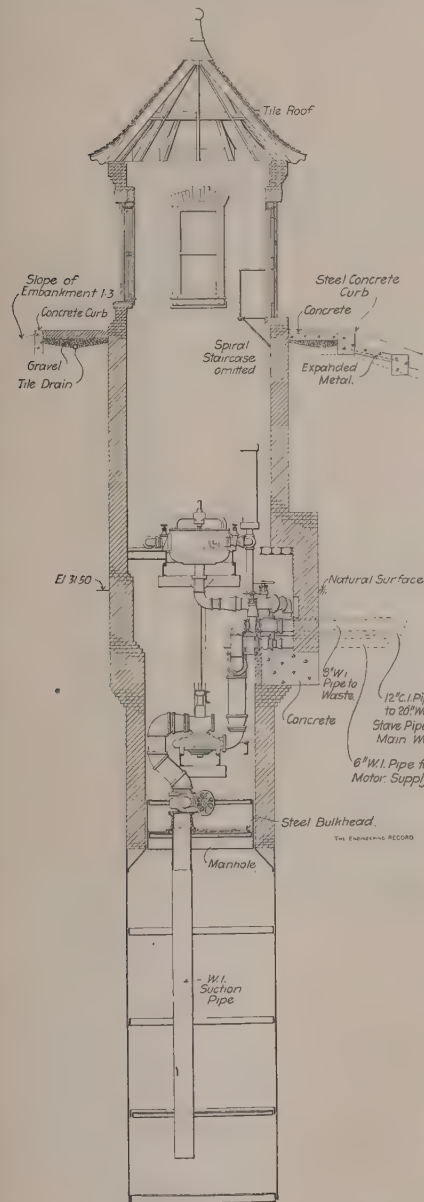
ning the actual construction of the plant, an embankment was built around the well site at El. 36.00, and a roadway at the same elevation was made from high ground to this embankment. Both roadway and embankment were made of red iron cinders from an old rolling mill near by. These cinders are very heavy, will not float up in high water, and make an ideal road material, being practically unaffected either by weather or the heaviest traffic.

As in the case of the pumping units in the first two hydraulic plants already mentioned, the motive power in the new well, which is known on the company's books as well No. 69, is water under pressure from the force main of the Worthington high-duty steam pumps at the pumping station. This water operates a 30-in. Pelton water wheel, direct-connected on the vertical shaft to an 8-in. centrifugal pump. The pump delivers the water through a 20-in. wood stave pipe into the main well, while the motor water, after it has done its work, is not lost, but flows back by gravity to the main well through the same pipe.

For conveying water under pressure to the Pelton wheel, an 8-in. steel pipe was laid. The pipe is what is known as line pipe, being slightly heavier than standard pipe and good for working pressures of considerably over 500

figure is a vertical cross section through well No. 69, showing in elevation the pumping machinery and pipes and fittings.

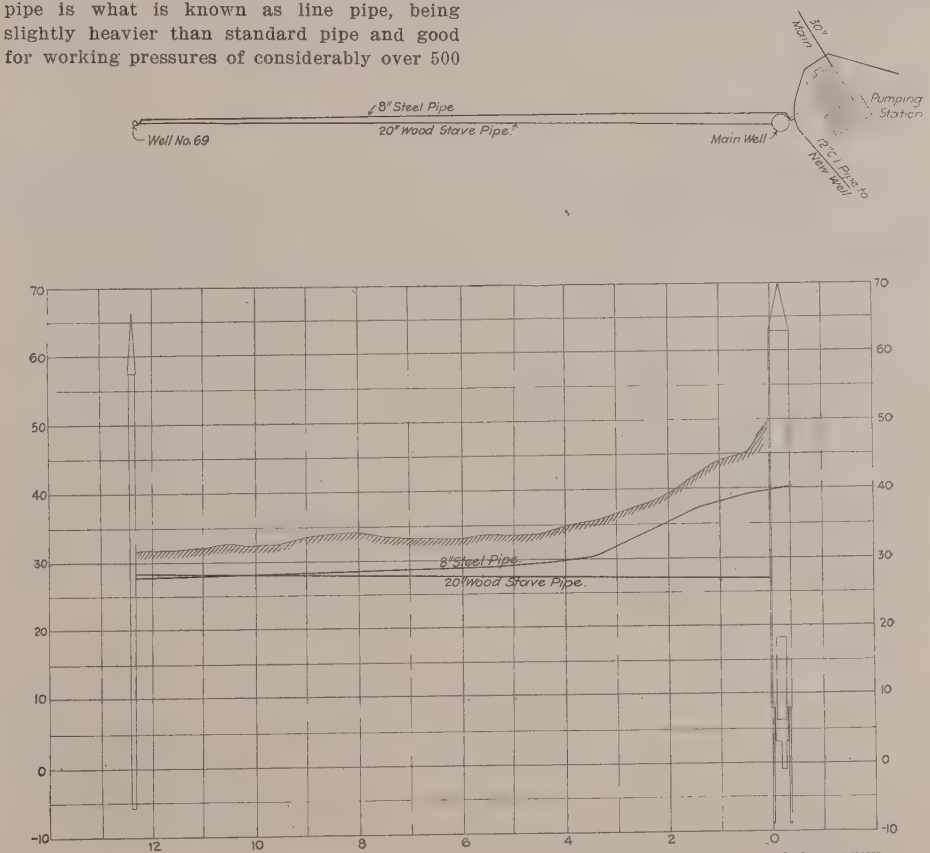
The well consists of a steel strainer separated by a steel bulkhead plate from the pump pit or dry well, which is of brick masonry, and is surmounted by a small circular brick well house. The strainer is 9 ft. outside diameter by 21.5 ft. long, and is built up of steel plates $\frac{5}{8}$ -in. thick, perforated with about 34,000 holes $\frac{11}{16}$ -in. in diameter. These holes are arranged in groups, each group being covered by a rectangular $\frac{1}{4}$ -in. plate, bent to fit closely to the inner surfaces of the $\frac{5}{8}$ -in. plates, and fastened thereto by cap screws removable from within, the joints being made water and air-tight by rubber gaskets. Through the steel bulkhead extends the suction pipe, which is in one piece and has no joint below the bulkhead. The bulkhead is also provided with a manhole opening into the strainer chamber. A 6-in. angle stiffens the cutting edge of the strainer, and a $3\frac{1}{2} \times 2\frac{1}{2}$ -in. angle was added to provide a support for the 40 tons of pig iron used to load the well in sinking. In the dry pump pit above the bulkhead, where they are always accessible, are lo-



Pump Setting, Well 69.

completed in 1895. The second plant, built in 1899, consisted of four hydraulic pumping units, each installed in a steel cylinder sunk by the pneumatic process in the bottom of the main well itself. These two plants served their purpose well, and nothing like a shortage has been experienced since their completion; but the large increase in consumption, due to the rapid growth of the city, made it advisable to provide still more water.

After all the available water-bearing gravel in the neighborhood had been carefully explored by test wells, it was decided to locate the new well at a point about 1,250 ft. almost due south of the main well. The natural surface of the ground at the well site was flat, its elevation being 31.50 Peoria city datum, and subject to overflow except at quite low water. Before begin-



Plan and Profile of Connections of Main Well and Well 69, Peoria Water-Works.

ing the actual construction of the plant, an embankment was built around the well site at El. 36.00, and a roadway at the same elevation was made from high ground to this embankment. Both roadway and embankment were made of red iron cinders from an old rolling mill near by. These cinders are very heavy, will not float up in high water, and make an ideal road material, being practically unaffected either by weather or the heaviest traffic.

The pipe used to convey the water from the pump and the water from the motor back to the main well is 20 in. inside diameter, is built of wood staves with $\frac{1}{2}$ -in. steel bands, spaced 8 to 12 in. apart, and slopes toward the main well on a grade of 0.1 ft. to 100 ft. Where the depth of fill over the pipe exceeded 12 ft., it was surrounded by from 3 to 5 in. of concrete.

The location of the main well, pumping station and well No. 69 are shown in the accompanying plan and profile, and also the 8-in. pressure pipe and the 20-in. wood stave pipe. The second

cated the Pelton wheel and centrifugal pump.

The wheel case is of special design, and the bow frame on its top carries thrust collars to take up any slight end thrust which may not be eliminated by the hydraulic balancing device on the runner of the pump. This bearing is lubricated by a Byron Jackson vertical self-oiling device which automatically pumps into the upper reservoir the oil which has run down into the lower reservoir, thus keeping the oil in constant circulation and the shaft continuously lubricated. This bearing is the only one in the plant which requires any oil, and as no oil is lost even here, one filling of the upper reservoir will last almost indefinitely.

Around the outside of the well there is an embankment of clay extending up to El. 47 P. C. D., which is above extreme high water, and

The Turbine Power Station of the Terre Haute Traction & Light Co.

At the present time, when the progress of the steam turbine is being regarded so closely, the construction features of the new turbine power station for the Terre Haute Traction & Light Co., at Terre Haute, Ind., will be of unusual interest. This station, which has just been completed, at present contains a 500-k.w. Curtis steam turbine operating in connection with a General Electric 2,300-volt, two-phase generator. The current is carried to the Cherry St. Station, where it is fed to the alternating-current bus-bars and used for street railway, city lighting and power purposes.

The arrangement of the building is shown in the accompanying plan and elevation. It is



General View of the Station.

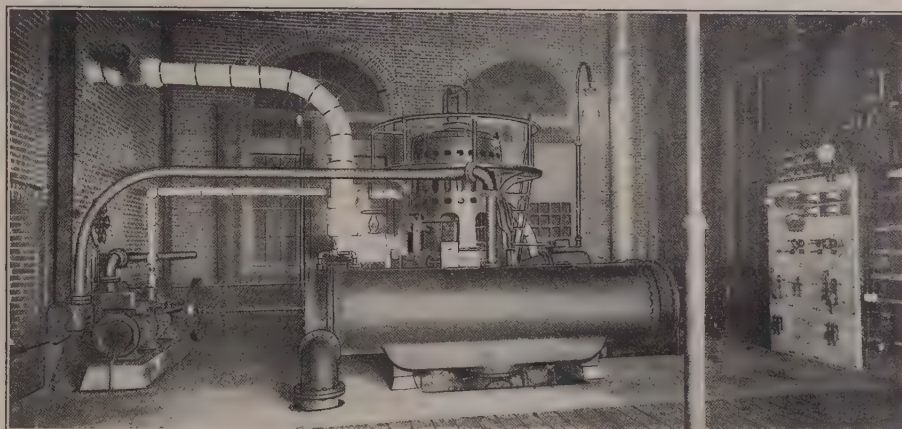
continues to a height of 40 ft. above the base. Circular construction then begins, this being 14 ft. in outside diameter, with walls $20\frac{1}{4}$ in. thick. The walls decrease in thickness by steps, and at the top, 165 ft. above the base, they are $7\frac{1}{2}$ in. thick. The bottom of the flue opening, which measures 5 ft. 6 in. wide by 9 ft. 3 in. high, is 21 ft. 6 in. above the base. The chimney was built by Messrs. M. W. Kellogg & Co., of New York.

The method by which the coal is delivered to the station is indicated in the general view of the station. A long spur from the tracks of the Vandalia Line is carried on a trestle along the east wall of the boiler room. Into the trestle work at this point is built a coal bunker, with the bottom sloping toward the boiler-room wall, which is of brick to a point above the bunker. Through this wall several openings are provided, as shown in one of the engravings, and from these a steel car receives the coal and conveys it to the boilers.

Two Cahall horizontal water-tube boilers, equipped with superheaters, are at present installed. These are rated at 520 h.p. each, and are guaranteed to raise 15,600 lb. of steam per hour to a pressure of 150 lb. and to a temperature of 515° Fahr., which corresponds to a superheat of 150° . At the present time the ashes are removed through the ash doors in the boiler front, but it is intended later to handle

steam per kilowatt-hour; at half load, the guaranteed consumption is 23 lb., and at 50 per cent. overload, it is 21.5 lb. When reduced to horse power, these figures give 15.66 lb. consumption at full load, 17.15 lb. at half load, and 16.03 lb. at 50 per cent. overload. From the base to the top of the generator the unit measures 12 ft. 4 in., and the diameter at the base is 7 ft. 8 in. The combined unit weighs 40,000 lb.

The bearings are oiled by means of a pressure oiling system carrying 180 lb. pressure. In the basement are installed two special duplex outside-packed plunger oil pumps, which force the oil from a storage tank into the high-pressure piping of the oiling system. From this the top bearing and step-bearing of the turbine are supplied with a continuous flow of oil through $\frac{3}{8}$ -in. outlets. After passing through the bearings, the oil returns by gravity to the storage tank. To assure of even pressure and to provide a reserve supply of oil under pressure should the pumps fail, an accumulator is connected with the high-pressure oil pipes. This consists of a piston standing 18 ft. high. Over this works a long cylinder, with an outside diameter of 18 in., the upper end of which is capped. A connection from the high-pressure pipes enters the piston at the base, and the pressure of the oil raises the cylinder on the piston, the amount of this pressure being governed by the number of iron weights which are



Turbine, Condenser and Dry Vacuum Pump in the Operating Room.

a one-story structure, rectangular in section, measuring 80 ft. 6 in. by 50 ft. 5 in., and built sufficiently high to afford proper handling of the heavier parts of the machinery by an overhead crane. A steel framework supports the roof trusses. Upon these rest 3x6-in. channel bars, which in turn carry the roof, consisting of 2-in. hard pine planking covered with tar and gravel. Only the south wall of the building is constructed permanently, this being of brick. The remaining exterior walls are of corrugated iron, with the exception of the brick division wall, which separates the boiler and operating rooms. All of the floors are of concrete, except that of the northern portion of the operating room, which is temporarily of 2-in. plank, as another turbine will probably be placed here. The concrete floor of that portion of the engine room over the basement is built in between 25-lb. 10-in. I-beams placed 3 ft. 8 in. apart.

In the general view of the power house the chimney appears much out of proportion in size to the building, it being constructed of ample size to be of service when the station is enlarged. The chimney foundation, of concrete, is octagonal in shape, and at the bottom measures 22 ft. across, narrowing by four steps to 16 ft. 2 in. at the top. The octagonal section

them from beneath by means of an ash car operating in a tunnel. The flue gases pass from the boilers through individual flues to a main smoke flue measuring 8 ft. square, which continues without curves to the chimney. Behind the boilers is a pipe trench covered over with an iron grill, which facilitates repairs to the several pipes running to the pumps and heaters. The boiler-feed pump and heater are shown in one of the accompanying engravings. The pump is of the duplex piston type, $7\frac{1}{2}$ x $4\frac{1}{2}$ x10 in. in size. The boilers deliver steam to an 8-in. flanged steam header, and from this a 6-in. main descends to the turbine. The auxiliaries are supplied by a branch from this main taken off near the turbine. Before this branch descends to the basement, where most of the steam auxiliaries are located, a supply pipe is carried to the dry vacuum pump located on the main floor near the boiler-room wall.

A brick foundation extending through the basement supports the Curtis steam turbine and generator. The turbine, rated at 500 kw. when running non-condensing, has a normal speed of 1,800 r.p.m., and this is guaranteed to vary not more than 4 per cent. with sudden fluctuations of the load, and not more than 2 per cent. with reasonable fluctuations. At full load the turbine will operate on 21 lb. of dry

placed upon the cylinder. When the cylinder is raised to a predetermined height, the supply of steam to the oil pumps is automatically shut off. Should the cylinder fall below a predetermined height, more steam is admitted to the pump. Should the pump in service fail, the cylinder, by falling a few inches lower than the regular lower limit, will admit steam to the second pump. In case both pumps should fail, there is enough oil in the accumulator to operate the system for a considerable length of time. The accumulator was constructed by Messrs. R. D. Wood & Co.

The turbine exhausts either direct into the condenser or through a 12-in. main which descends to the basement, to a free exhaust extending through the roof of the building. The general view of the operating room shows the Alberger counter-current surface condenser on the main floor near the turbine. When a sufficient amount of condenser water is supplied at 70° , the condenser is to maintain a vacuum of not more than 2 lb. absolute pressure when condensing 12,000 lb. of steam per hour. The condensing surface consists of 844 seamless brass tubes $\frac{3}{4}$ in. in diameter, secured at either end in tube sheets in such a manner as to permit of the necessary contraction and expansion. The circulating water is piped in at the top

and at one end, and after making three passes through the tubes, leaves at the opposite end. The condensed water falls downward over the tubes to the hot well. A double-acting piston pump of the submerged type, automatically controlled by a float in the hot well, pumps the condensed water to the main storage reservoir.

Vacuum is maintained in the condenser by means of a two-stage Alberger rotative dry-vacuum pump, which is located on the main floor of the operating room. Condenser water is obtained from the Wabash River. Near the river bank is located a hot and cold well. The intake and discharge pipes from this are 30 in. in diameter and extend into the river, a distance of 30 ft. being laid several feet below the water level. On account of the presence of quicksand, a cofferdam of the usual construc-

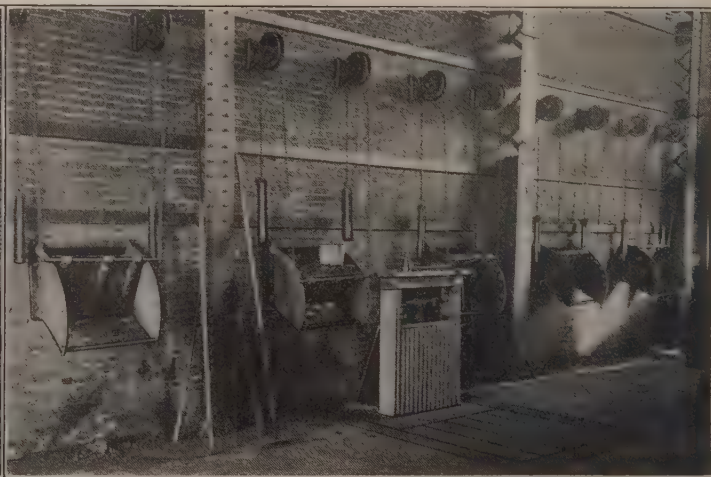
satisfactorily with a suction of 20 ft. and a discharge head of 15 ft. As it is located, the center line of the intake is 19.6 ft. above the low-water mark of the river. Discharge and supply pipes are in position for an additional pump in the basement; this additional pump is of the duplex piston type, and it can be used for various services. It is employed, for example, to supply the necessary make-up water to the condenser system, and also to empty the drainage sump in the basement. The exhaust from the several auxiliaries is led to the heater in the boiler room. Around the heater the usual by-pass is provided, and when desired, the exhaust may be passed direct to the atmosphere through a riser extending through the roof.

The generator, which is direct-connected to the steam turbine immediately above it, is a

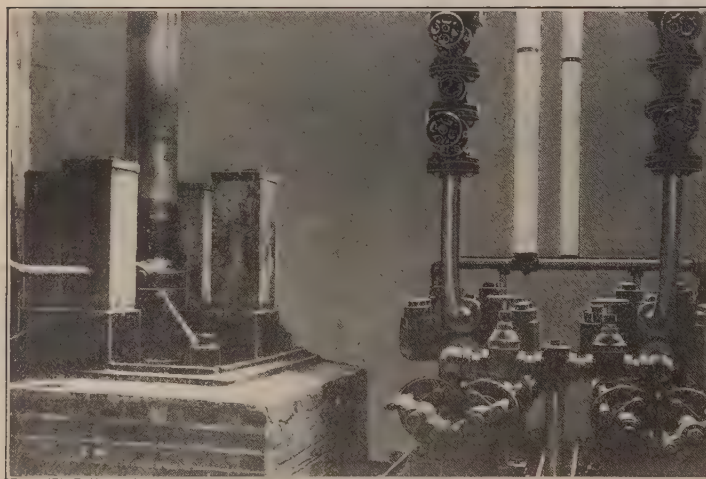
All the apparatus of the switchboard is of the General Electric make. The three panels of the board are of blue Vermont marble. The one on the left is mounted with the necessary instruments and switches for the motor-generator set; the central panel controls the generator; while the one on the right is for the load. The exciter panel carries a 25-ampere Thomson astatic ammeter, a 2,500-volt oil switch and an overload relay. A 15-ampere Thomson recording wattmeter mounted on the back of the board measures the energy input of the exciter set. On the generator panel is a 300-ampere, two-pole, single-throw knife switch, a 175-volt Thomson astatic volt-meter and a 400-ampere ammeter. The load panel is equipped with an overload relay, a 300-ampere type F four-pole oil switch, a power-factor



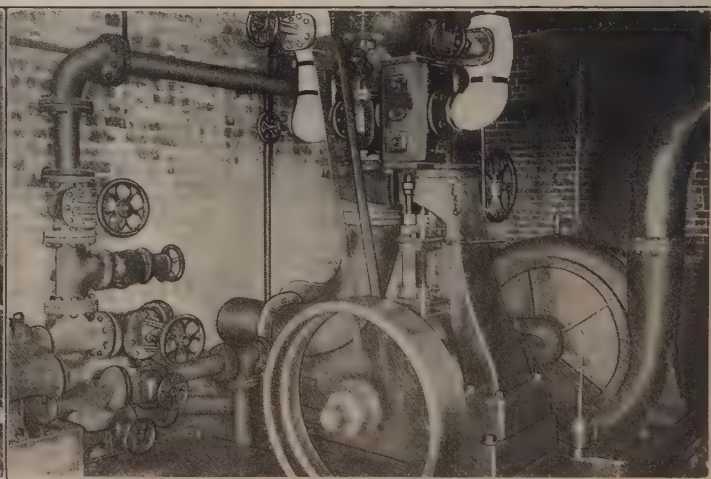
Feed Pump and Heater.



Gates on Chutes from Coal Bunkers.



Oil Pumps and Base of Accumulator.



Engine-Driven Centrifugal Circulating Pump.

tion had to be built out into the river for the excavations for these pipes and intake. Several times, just as the pipes were ready to be placed in position, quicksand suddenly rose up from the bottom and completely filled the excavation. The pipes as laid are supported on cross timbers between piles driven on either side.

Cast-iron pipes 24 in. in diameter connect both the hot and the cold wells with the station. That from the cold well goes direct to the circulating pump located in the basement, this pump being of the centrifugal type direct-connected to a vertical steam engine. The pump has a 12-in. suction pipe and a 10-in. discharge, the suction pipe dividing to enter the pump on each side of the volute. It was built to work

four-pole, two-phase, 60-cycle machine, generating current at 2,300 volts. The guaranteed temperature rise with a continuous current is not to exceed 40° Cent., and an overload of 100 per cent. momentarily applied is not to injure the machine. When full non-inductive load is thrown off, the maximum rise in voltage allowed is 8 per cent., the speed and excitation remaining constant. Field excitation current is furnished by a 10-kw. motor-generator set located near the west wall of the building. Current for the induction driving motor is obtained from the Cherry St. station, over the wires which are also used for lighting the engine and boiler room when the turbine is not in operation. By means of two single-phase transformers, this current is stepped down.

meter, an indicating wattmeter, and two 200-ampere ammeters, one in each phase. A 150-ampere recording wattmeter measures the total output. Four 0000 cables carry the current direct to the switchboard of the Cherry St. station. Over the same pole line smaller wires are carried from the Cherry St. station for the various purposes mentioned.

The station was erected by the Columbia Improvement Co., of Boston, Mr. O. A. Bridges superintending the work. On May 14 the excavation was not yet finished; yet on May 28, just fourteen days later, the foundations were almost completed. On July 9 the chimney was erected and the framework of the building was up. On Nov. 5 the plant was operated under full load.

A Test of an Air Lift Pumping Plant.

The following results were secured in a test made recently on a Pohle air-lift pumping system installed in a large southern brewery. The compressor furnishing air was an Ingersoll-Sergeant 10x10-in. Class E machine run at a speed of 100 r.p.m., corresponding to a piston displacement of 89 cu. ft. of free air per minute. In this test the air and water pipes were lowered to a depth of 167 ft. below the surface for the purpose of cleaning out an accumulation of about 33 ft. of sand and dirt which had gathered at the bottom of the casing. This necessitated the very deep submergence, and accounts for the unusual air pressure required at the compressor. After the well has been cleaned out thoroughly the pipes will be raised until a depth of about 98 ft., is reached, when an air pressure of 40 or 45 lb. will deliver the required quantity of water. The details of the test are as follows:

Original depth of the well.....	223 ft.
Depth of the well when the test was made.....	187 "
Diameter of the well casing.....	7 1/2 in.
Standing water level.....	14 ft.
Drop in level when pumping.....	21 "
Lift above the surface.....	8 1/2 "
Total lift from lowest water level, when pumping, to the point of discharge.....	44 "
Depth through which water and air pipes were lowered.....	167 "
Submergence.....	74 per cent.
Quantity of water lifted, per min.....	264 gal.
Air pressure at starting.....	68 lb.
Working air pressure.....	60 "
Diameter of water discharge pipe.....	8 1/2 in.
Diameter of air pipe.....	1 1/2 "
Horizontal distance from receiver to well.....	246 ft.

Tests of Steam Pipe Coverings.

Some tests of pipe covering were made the subject of a thesis investigation last year by Messrs. H. T. Borsheim and L. C. Moody, who were graduated in 1904 from the Iowa State College, of Ames, Ia. A length of 22.5 ft. of standard 4-in. wrought-iron pipe was used, suspended where it would not be subjected to air currents, and the pipe had an inclination of 1 ft. in its entire length to collect the drainage and arrange for weighing it at one end. The steam was admitted through a 1-in. pipe; a steam trap was connected to it to secure as dry steam as possible and a throttling calorimeter was placed between the trap and the test pipe. The condensed steam was collected through a 3/4-in. pipe delivering into a tank of cold water to insure against loss by re-evaporation of the water of condensation. The tank was placed on a pair of platform scales, but to obtain an accurate measurement of the temperature and the amount of condensed steam, the water level in the 3/4-in. pipe was maintained constant, as observed in a gauge glass, by means of a valve in that pipe. A pressure gauge was connected to the admission end of the test pipe. The pipe was suspended in a small room 10x26 ft. in size and for measuring the temperature of the room three thermometers were hung near each side of the pipe, at intervals of 10 ft. In a recent issue of the "Iowa Engineer" the results are given at length.

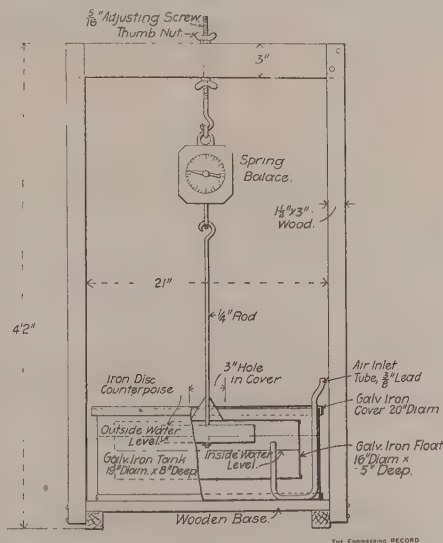
Four and 6-in. coverings from four different manufacturers were tested, including asbestos air-cell, asbestos sponge and 85 per cent. magnesite coverings. Tests were run at 20, 40, 60, 80 and 100 lb. steam pressure, and the condensation in each case was compared with the condensation occurring with the bare pipe. While the condensation per square foot per hour increased with the increase in pressure, the saving over the bare pipe in each case did not appear to depend on the pressure. It ranged for the nine different coverings and over the five different steam pressures from 76 to 89.5 per cent., the average saving being 81.8 per cent.

The condensation occurring in the bare pipe with 20 lb. pressure was 2.405 B.t.u. per hour

per square foot per degree difference in temperature between the air and the steam, which difference was 165.75°; the unit of condensation with 40 lb. pressure was 2.589 B.t.u. per square foot per degree of temperature difference, which amounted to 185.34°; the unit of condensation with 60 lb. steam pressure was 2.686 B.t.u. per degree, the difference in temperature in this case being 210.31°; the unit condensation with 80 lb. steam was 2.752 B.t.u. and the temperature range, 226.73°, and the unit of condensation with 100 lb. steam was 2.897 B.t.u., and the corresponding temperature difference, 233.970°.

An Experimental Air-Pressure Gauge.

In connection with the investigation conducted by Prof. G. W. Bissell, of the Iowa State College, on the condensation occurring in indirect pipe-coil heaters for fan systems of warming and ventilation, reported on page 113 of the issue of Jan. 28, a special draft gauge was developed as shown in the accompanying illustration. The air pressures in the heater casings were measured by means of this gauge connected by rubber tubing to 1/4-in. iron pipes with carefully squared ends, which projected into the interior of the heater duct at the points desired. The apparatus illustrated was the re-



Experimental Draft Gauge.

sult of experiments to secure a satisfactory multiplying draft gauge and was found to meet all requirements as to accuracy, quickness of operation and delicacy of measurement. It consists of a tank of water in which a weighted float is suspended from a spring balance and under which float the compressed air is introduced through the curved inlet tube. By sufficiently weighing the float the scale pointer was made to revolve nearly around the dial and its point of rest taken as the gauge zero. The instrument was then calibrated, and a dial was prepared from the calibration to read directly in inches of water pressure. It was found, according to Prof. Bissell, that 0.001 in. could be accurately read.

NATURAL DRAFT of 1.01 in. and a temperature of the gases of combustion at the intake to the chimney of 525° are reported to be the operating conditions at the power station of the Stark Electric Railroad Co. (which operates a 37-mile line extending from Canton to Salem, in Ohio) when one boiler is working at its rating of 350 h.p. This is a Stirling water-tube boiler having 3,500 sq. ft. of heating surface, and the stack is of steel, 78 in. in diameter and 150 ft. high.

Letters to the Editor.

A SPECIAL PROBLEM IN REINFORCED CONCRETE.

Sir:—A problem in steel-concrete design, not usually discussed in English and American publications, was recently brought before my attention. It came up in connection with the design of the floor or invert of a dry dock. The pressure transferred from the side walls of the dock upon the floor, combined with the upward pressure of the water underneath it, produced a thrust at the central longitudinal section of the floor. This thrust was practically horizontal and was located above the center of the section and outside of the middle-third. The problem was to ascertain the necessary amount of steel rods to be placed near the extreme fibers of the floor so as not to increase its thickness. A general solution of this problem is given in what follows.

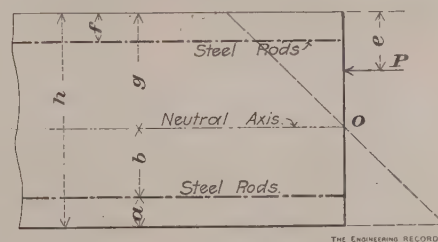
One-foot width of the invert is considered. P is the total normal pressure for 1-ft. width of the invert. The symbols shown in the diagram will be readily understood. The dashed line is a strain diagram for all the elements of the section. It is assumed that the strain for any element varies directly with its distance from the neutral axis.

Let A_c = total sectional area of steel in the compression side for 1-ft. width of invert;

A_t = total sectional area of steel in the tension side for 1-ft. width of invert;

C_e = compressive stress per square foot of concrete at the extreme fiber;

C_s = maximum allowable compressive stress for steel, less C_e ;



T_e = tensile stress for concrete at the extreme fiber;

T_s = maximum allowable tensile stress for steel, less T_e ;

E = coefficient of elasticity for steel;

E_c = coefficient of elasticity for concrete in compression;

E_t = coefficient of elasticity for concrete in tension.

All the units are homogeneous and are in pounds and in feet.

Two equations of condition for equilibrium must be satisfied. They are:

(1) The algebraic sum of all the horizontal forces arising from the strain in the concrete and steel must equal the total thrust P ; and

(2) The sum of the internal moments taken with reference to any axis must equal the moment of P taken with reference to the same axis.

These conditions, expressed algebraically, yield the following equations:

$$\frac{1}{2} C_e g + C_s A_c - \frac{1}{2} T_e (b + a) - T_s A_t = P \dots (1)$$

$$\frac{1}{2} C_e g^2 + C_s A_c (g - f) + \frac{1}{2} T_e (b + a)^2 + T_s A_t b = P (g - e) \dots (2)$$

in which O is the center of moments.

These equations involve the assumption that the stress in the concrete varies directly with the strain, although the rates of variation or the coefficients of elasticity for concrete in compression and in tension may vary.

From the assumption that the strain curve is straight, the following may be deduced:

$$\frac{C_e}{g E_c} = \frac{C_s}{(g - f) E} = \frac{T_s}{b E} = \frac{T_e}{(a + b) E_t} \dots (3)$$

In addition, we have the necessary geometrical relation,

$$b = h - (g + a) \dots \dots \dots (4)$$

In the six equations above given, the values of E , E_c , and E_t are known from experiments; a and f may be arbitrarily assumed. The conditions of the problem will give values for h , e , and P . Put for C_s and T_s the maximum allowable values for compressive and tensile stresses of steel less those for concrete, respectively.

From the equations (1) to (4) the values for g , b , A_s , A_c , C_c , and T_c may be obtained. C_c and T_c must not be more than the maximum allowable compressive and tensile stresses for concrete.

Neglecting the tensile resistance of concrete, T_c equals zero and the equations become

$$\begin{aligned} \frac{1}{2} C_c g + C_c A_c - T_s A_s &= P \\ \frac{1}{2} C_c g^2 + C_c A_c (g - f) + T_s A_s b &= P(g - e) \\ \frac{C_c}{g E_c} = \frac{T_s}{b E} &= \frac{T_s}{b E} \\ b &= h - (g + a). \end{aligned}$$

If no steel is to be placed in the compression side of the neutral axis, the following equations are obtained by making the value of A_c zero:

$$\begin{aligned} \frac{1}{2} C_c g - T_s A_s &= P \\ \frac{1}{2} C_c g^2 + T_s A_s b &= P(g - e) \\ \frac{C_c}{g E_c} = \frac{T_s}{b E} &= \frac{T_s}{b E} \\ b &= h - (g + a). \end{aligned}$$

This method of solution is also applicable to steel-concrete arches for which the line of pressure is obtained and for eccentric loading on steel-concrete columns.

Yours truly, S. D. BLEICH.

New York, Jan. 21.

THE FLOW OF PORTLAND CEMENT.

SIR:—On a number of occasions the writer has found it necessary to design storage bins, or stock-houses, for the storage of Portland cement in bulk. As a rule the cement has been in practically the same condition, direct from the grinding mills, either tube mills or Griffin mills, and hence was hot and more or less filled with air. Under these conditions Portland cement is a very peculiar material, often flowing like water, and again, after standing awhile, it becomes very solid and stands almost perpendicular before flowing.

In the design of these stock-houses, or bins, two questions have always come up; first, the angle of repose of cement to determine the correct height of the supplying conveyor, when it was wished to fill cement on the side walls to a certain height, and second, the correct side pressure to allow on the side walls.

During the past few months the writer has been able to collect data which answers the first question more or less satisfactorily.

The stock-house in which the experiments were tried is 200x90 ft., with 20-ft. side walls of reinforced concrete. This building was divided into four 50-ft. bins, each calculated to contain about 25,000 bbl. Two screw conveyors, bringing cement to the building, are carried in a monitor running lengthwise of the building, about 36 ft. apart on centers, the opening in the bottom of the conveyor being about 28 ft. above the floor of the stock-house.

At various intervals during the filling of the several bins measurements were taken from one of the overhead beams to the surface of the cement, thus determining the curve at which the cement flows when filling the building. A photograph showing the curve of the cement at one of these times is attached.

One of the accompanying diagrams shows one of the curves determined experimentally, together with the diagram showing how the

equation was derived to fit the curve; it being desired to determine the depth of cement at any point at a certain horizontal distance from the center of the discharge spout. The points shown on this curve were taken from actual measurements, plotted together with a number of other curves, and the curve best passing through them was found experimentally. This proved to be, in part, a circle. To obtain the equation of this, the work is based on the fundamental equation of the circle,

$$(x - a)^2 + (y - b)^2 = r^2 \quad (1)$$

where a and b are constants, x and y are the horizontal and vertical distances to any points on the curve, and r equals radius of circle.

It was determined graphically that $a = 41$; $r = 78$; $b = 66.5 + h$; where h equals distance from floor to peak of pile, all measurements in feet.

Substituting in the fundamental equation (1) and solving for y we obtain,

$$y = 66.5 + h - \sqrt{(4403 + 82x - x^2)} \quad (2)$$

where y = depth of cement at any point, a distance, x from center of discharge spout; x = distance from center of discharge spout; h = height from floor to peak of cement pile, or bottom of conveyor spout.

It was found, graphically, that the above curve will apply only for a distance $1.25h$ from discharge spout. Beyond this point the angle of repose becomes about constant at 6 deg. from the horizontal.

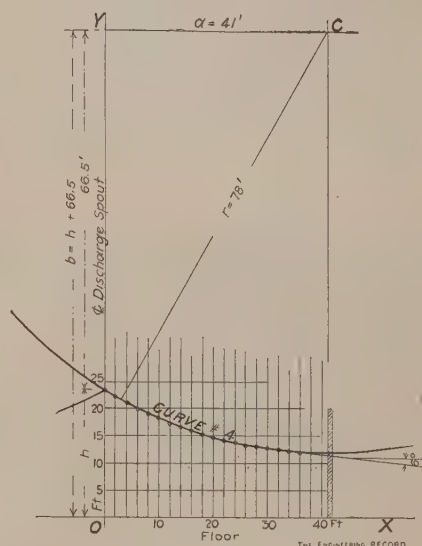


Fig. 1. Derivation of Curve Formula.

To illustrate the application of equation (2) assume a stock-house 60 ft. square, with cement coming in at the center 30 ft. above the floor; it is required to find the height of cement on the side wall. In this case y = depth of cement, $x = 30$ ft., and $h = 30$ ft.

$$y = 66.5 + h - \sqrt{(4403 + 82x - x^2)} = 19.3 \text{ ft.}$$

If it is required to find the necessary height of conveyor in order to get the maximum capacity from a stock-house having a height of side y , then the equation becomes

$$h = y - 66.5 + \sqrt{(4403 + 82x - x^2)}$$

where h = height from floor to bottom of conveyor, y = height of wall, and x = distance from wall to discharge spout.

The second diagram shows four curves found in this way. The points shown are observed data, while the curves were worked out according to the equation. The writer realizes that this equation thus obtained is not a rational one, being mainly experimental, but the diagram shows how nearly the actual flow corresponds to the equation; near enough, at least, for the determination of the necessary

height of a cement stock-house of ordinary dimensions.

It is interesting to note that on all the curves shown the angles of repose, or flow of cement, for a distance of at least 2 ft. from the center of the discharge approach closely to a slope of 30 deg. from the horizontal. The figure would, therefore, be of use in determining the capacity of cement storage bins of a maximum diameter of 16 ft.

In using this angle of repose for the design of small bins it must be borne in mind that the cement coming into the bins with considerable velocity tends to pile up next to the wall, being sometimes 1 ft. higher there than in toward the spout a little ways. In making these experiments in the large stock-house it seemed to make no difference with the curve whatever, whether the cement was discharged from the spout directly at the top of the pile or fell through the air a considerable distance.

The writer has under way experiments to determine the actual side pressure on the sides of storage bins for cement. In making these



Slope of Cement in Bin.

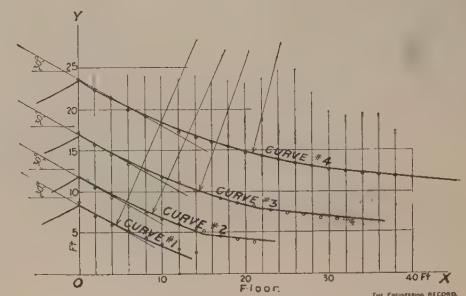


Fig. 2. Curves of Portland Cement.

experiments 18-in. rubber diaphragms were used, and the data already collected give us hope of very good success. Enough data have not yet been collected to make sure of the side pressures, but from the figures at hand it would seem that the pressure is considerably different than that which would be developed by water pressure, or that upon retaining walls for earth; these two methods being the ordinary ones for computing the strength of side walls.

If work has been done along either of these lines previously, it has not come to the writer's notice; and it was thought these equations might be of use in producing the opinions of others regarding them.

Yours truly, J. W. PRINCE,
Supt. Great Northern Portland Cement Co.

THE COOLING OF EXHAUST GAS from a gas engine by means of water is attended by neither a loss nor gain, in the experience of Mr. Hugh Campbell, who said in discussing the Guernsey producer-gas plant, that the sole object of the cooling was to reduce the noise.

CURRENT NEWS SUPPLEMENT

FEBRUARY 4, 1905.

RECTORY OF NATIONAL ENGINEERING SOCIETIES.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Chas. Warren Hunt, 220 West 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, F. R. Hutton, 12 West 31st St., New York.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, 95 Liberty St., New York.

AMERICAN INSTITUTE OF MINING ENGINEERS. Secretary, R. W. Raymond, 99 John St., New York.

AMERICAN INSTITUTE OF ARCHITECTS. Secretary, Glenn Brown, Washington, D. C.

ASSOCIATION OF ENGINEERING SOCIETIES. Secretary, John C. Trautwine, Jr., 257 South 4th St., Philadelphia, Pa.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, W. M. Mackay, 35 Water St., New York.

CANADIAN SOCIETY OF CIVIL ENGINEERS. Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Prof. M. S. Letchum, University of Colorado, Boulder, Colo.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y.

ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS. Secretary, S. F. Paterson, Concord, N. H.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago. Annual meeting at Chicago, March 21, 22 and 23.

AMERICAN WATER-WORKS ASSOCIATION. Secretary, J. M. Diven, Elmira, N. Y.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Richard Moldenke, P. O. Box 432, New York.

ENGINE BUILDERS' ASSOCIATION OF THE UNITED STATES. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

ANNUAL MEETING, CANADIAN SOCIETY OF CIVIL ENGINEERS.

The annual meeting of the Canadian Society of Civil Engineers was held at Montreal on Jan. 24 and 25. Lieut.-Col. W. P. Anderson, of Ottawa, the president, occupied the chair.

The report of the Council was presented, showing a total membership, including honorary and associate members, of 1,253, being an increase of 108. Eleven deaths had taken place during the year. Seventeen meetings had been held at which a number of important papers were read. The report stated that the Gzowski medal had been awarded to J. A. Jamieson, of Montreal, for his paper on "The Pressure of Grain in Deep Bins."

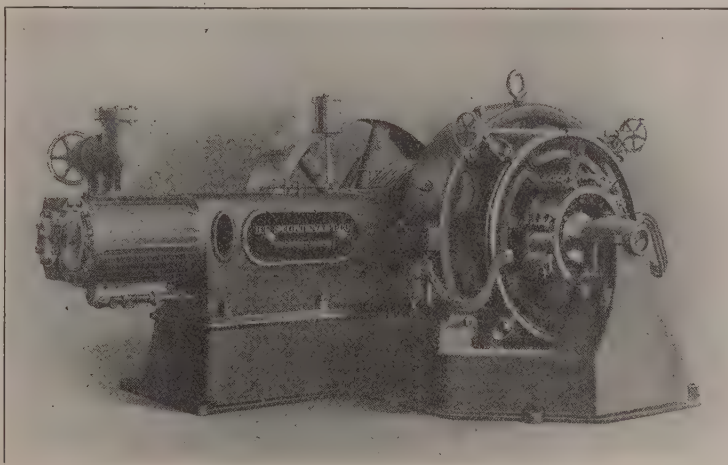
A discussion arose over letters received from members in western Ontario and Manitoba, who complained that the sphere of the society's operations was too much centralized so that the members in the more remote sections received comparatively little benefit from it. H. Irwin, of Montreal, treasurer, in reply to these strictures, said that in a society whose members were so widely scattered, this was in a measure unavoidable. The president did not think that the establishment of branches at various points would do much to remove the difficulty, as a large proportion of the membership would still be isolated.

During the day the members visited the works of the Dominion Bridge Co., the Dominion Wire Manufacturing Co., and the works of the Allis-Chalmers-Bullock Co.

The principal feature of the evening session was the address of Col. W. P. Anderson, the retiring president. He dwelt on the extent of past engineering achievements in

Canada, his attention having specially been drawn to the subject by noticing the strong impression made upon members of the parent engineering society, the Institute of Civil Engineers, during their visit to Canada in September last. They saw what Canadian engineers had been able to do with the small resources at their command, and they recognized the great promise that Canada held out for engineering enterprises. The water powers of Canada were referred to as a great factor in industrial development, and the speaker pointed out that a further source of prospective riches was the presence on a large scale of the constituents of Portland cement, at points convenient for shipment. The building of another great transcontinental railway would for many years to come create a large demand for engineers, which could not but give a stimulus to the profession. He thought that the society should advocate the establishment of a central bureau for the registration of plans of all surveys made in Canada. Better surveys of the Dominion ought to be made, based upon some general comprehensive scheme connected with the county geodetically. Col. Anderson also referred to the improved aids to navigation established by the Department of Marine and Fisheries in recent years.

At Wednesday's session papers were read by E. M. Archibald on "The Effect of Load Factor on the Cost of Electrical Power," and by C. B. Smith on "The Construction of the Canadian Niagara Power Co.'s Plant, Niagara, Ont."



THE NEW STURTEVANT GENERATOR SET.

The election of officers resulted as follows: President, Ernest Marceau, Montreal; first vice-president, C. H. Keefer, Ottawa; second vice-president, D. McPherson, Montreal; third vice-president, G. A. Mountain, Ottawa; treasurer, H. Irwin, Montreal; secretary, Prof. McLeod, Montreal; librarian, H. R. Lordly, Montreal; Councillors, John Kennedy, W. S. Tye, P. W. St. George, Dr. Owen, R. J. Durely and Dr. J. B. Porter, all of Montreal; D. A. Keefer, New Westminster, B. C.; C. H. Rust, Toronto; A. E. Doucet, Quebec; Phelps Johnston, Lachine; R. W. Leonard, St. Catharines, Ont.; W. B. Mackenzie, Moncton, N. B.; M. J. Butler, Ottawa; G. J. Desbarats, Sorel, and H. C. Burchall, Newfoundland.

A GENERATING SET EMBRACING NEW FEATURES.

The B. F. Sturtevant Co., of Boston, Mass., is now manufacturing a generating set having several new features. The reciprocating parts of the engine are counterbalanced with lead load disks and a feature of construction is forging the crankshaft solid in one piece and shrinking the disks onto it. A special arrangement of the Rites governor gives a regulation within 1 to 1½ per cent. from full load to no load, and by a modification of the Marshall valve gear an adjustment of the cut-off from zero to 70 per cent. is attained. A recent improvement is a water-shed parti-

tion which prevents the water from the piston rod stuffing box from reaching the interior of the engine frame, and the oil on the reciprocating parts from being thrown into the engine room. The crank webs are enclosed by a cast iron hood having two holes with removable covers, one for the purpose of cleaning the crankpin box while it is in motion and the other for removing the box without taking off the large hood. Between the watershed partition and the front end of the cylinder, is a hand hole for reaching the stuffing bolts with communication to the oil spaces.

There are two oiling systems for this type of engine, the gravity or tank system and that by forced pump lubrication. With the gravity or tank system shown in the illustration, an oil tank supplies the pipes leading to the parts to be oiled. At each point where the oil is delivered is a little gauge glass and valve for regulating the flow at that point. A valve just below the tank regulates the entire oiling system.

With the pump, or forced lubricating system, a pump is located in the base of the engine and is operated by the crankshaft. Oil is delivered from this pump to the main bearings and from the main bearings through holes in the crankshaft and web to the crankpin. From this point the oil is conducted up through a hole in the connecting rod to the crosshead pin. A separate set of pipes conveys the oil from the crosshead guides to the valve stem guides. The pressure of oil in the bearings under this system will vary

Disposal at Columbus," G. A. Johnson, engineer in charge, Columbus Sewage Testing Station; "The Co-operative Topographical Survey of Ohio," Prof. C. E. Sherman, of Ohio State University; "Street Railway Tracks and Pavements," J. M. Harper, chief engineer Interurban Ry. & Terminal Co., Cincinnati; "The Common Roads of Ohio," J. F. Brown, special agent, Department of Road Inquiries; "The Building of the C. C. & St. L. R. R.," F. R. Charles, Richmond, Ind.; "Cement or Concrete Roadways," H. L. Weber, city engineer, Richmond, Ind.; "The Reservoir System at the Headwaters of the Mississippi River," Prof. B. E. Trask, Denison University, Granville; "Stream Gaging in Ohio by the State Board of Health and the U. S. Geological Survey," R. Winthrop Pratt, engineer, State Board of Health of Ohio; "A Three Hinged Concrete Steel Arch Bridge," L. A. Keith, city engineer, Mansfield; "Hugh Baird, a Historical Sketch of Ye Old Tyme Surveyor," Homer C. White, county surveyor, Warren; "Reinforced Concrete Retaining Walls," F. A. Bone, U. S. assistant engineer, Cincinnati; "The National Pike," J. H. Asher, county surveyor, London; "Some Phases of Sewage Disposal," Frank A. Barbour, M. Am. Soc. C. E., Boston, Mass.

Following Mr. Pratt's paper, Mr. M. O. Leighton, Chief of the Division of Hydro-Economics, U. S. Geological Survey, gave an outline of the work of the department. Mr. Barbour exhibited lantern slides of several modern disposal plants. The Society visited the Columbus Sewage Testing Station where the various methods of purification under consideration were explained by Mr. G. A. Johnson, engineer in charge; Mr. A. E. Kimberly, chemist; Mr. W. R. Copeland, bacteriologist, and Mr. Shute, assistant engineer.

Mr. J. B. Strawn, of Salem, O., was elected an honorary member.

By a unanimous vote the name of the Society was changed, the new title being "The Ohio Engineering Society."

Officers were elected as follows for the ensuing year: President, Paul R. Murray, New Philadelphia; vice-president, E. A. Kemmler, assistant city engineer, Columbus; secretary and treasurer, E. G. Bradbury, Columbus; board of trustees, G. A. McKay, city engineer, Xenia; W. H. Sieverling, city engineer, Springfield; W. H. Evers, county surveyor, Cleveland; John Laylin, city engineer, Norwalk; Prof. B. E. Trask, Denison University, Granville.

TRANSFORMER OUTFITS FOR THAWING PIPES.

The manifest superiority of electricity as a thermal agent in thawing frozen pipes and the field for this service that awaits development have attracted a considerable amount of attention on the part of central station managers, many of whom have improvised outfits for this purpose. There has arisen a very general demand for thawing outfits having a range in capacity to cover all ordinary requirements, which are portable, easy to connect and moderate in price, and to meet this demand the Westinghouse Electric & Manufacturing Co. has designed the two transformers herein described.

The larger of the two outfits, of which a back view is shown, weighs complete with transformer, switchboard and base, 750 lb. It occupies a floor space 2 ft. 4 in. by 1 ft. 10 in., and is 1 ft. 7 in. in height. A link in the top of the transformer case affords a means of lifting the outfit, and if desired truck wheels may be attached to the wooden base. It will be seen that it is of small size and is lighter in weight than any other outfit for the same purpose, giving it a superior portability.

The transformer may be operated satisfactorily on circuits varying from 1,800 to 2,500 volts. The low tension is arranged to deliver approximately 500 amperes for several hours at an e. m. f. from 15 to 50 volts. By a simple change in connections, the windings may be arranged to deliver about 1,000 amperes at voltages from 8 to 16, for thawing large mains whose resistance is generally low. It is suitable for thawing anything from a ½-in. service to a 1-ft. main.

from 12 to 18 lb. per square inch. The mechanical efficiency of the engine is so materially increased by this system of lubrication that its demand is rapidly increasing. The generator of this set is of the 8-pole type.

ANNUAL MEETING, OHIO SOCIETY OF SURVEYORS AND CIVIL ENGINEERS.

The twenty-sixth annual meeting of the Ohio Society of Surveyors and Civil Engineers was held at the Great Southern Hotel, Columbus, Jan. 23, 24 and 25. The meeting was the most largely attended for several years and a most encouraging revival of interest and enthusiasm was evident throughout the meeting. The report of the Secretary-Treasurer showed a large increase of membership and a satisfactory financial condition. Including applicants elected at this meeting, the membership has doubled in the past year.

Addresses were made by Hon. Wade H. Ellis, attorney general of Ohio; Hon. Robert H. Jeffrey, mayor of Columbus, and J. W. Payne, city engineer, Akron, retiring president.

Papers were read as follows: "Highways," by J. W. Turner, county surveyor, Jackson; "Proposed Improvements in Water Supply and Sewerage at Columbus," E. A. Kemmler, assistant city engineer, Columbus; "Experimental Work in Sewage

The transformer is generously designed, and will deliver large overloads for short periods of time. The windings are air cooled. The insulation is not injured by rain, snow or ordinary abrasion. There are no moving parts to get out of order, and the entire outfit is contained in a single unit.

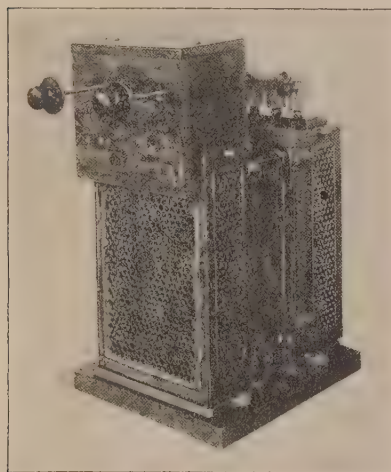
A light but substantial switchboard is mounted upon the high tension end of the transformer. The switches are of the enclosed plug type, such as are used upon high tension arc light circuits, and permit a variation of the low tension voltage, and consequently the current supplied to the pipes. The switches are so arranged that it is impossible to make a wrong connection.

The smaller transformer outfit is particularly adapted for thawing service piping about dwelling houses. It is light, of such proportions as to make it easy to handle, and is mounted in a wooden box provided with a handle and shoulder strap. It has a capacity of 200 amperes at potentials up to 25 volts for one hour. It is arranged for operation off a nominal 2,000 volt circuit, but can be supplied for any other primary voltage to as low as 200 volts. The voltage regulation and current control are obtained through plug switches in the high tension circuit.

When desired, these outfits are furnished with a current measuring device, so that the operator may know the amount of current that is being used.

A NEW FRANKLIN AIR COMPRESSOR.

The accompanying illustration shows one of the air compressors recently furnished the Pennsylvania R. R., for its new shops at Altoona, Pa. They were designed and built by the Chicago Pneumatic Tool Co., of Chicago, at its compressor plant in Franklin,



TRANSFORMER FOR THAWING PIPES.

Pa., and belong to what it designates as its C. S. C. class of machines, having compound steam cylinders and compound air cylinders. They are designed to run non-condensing with a boiler pressure of 100 lb. The high and low pressure steam cylinders are 11 and 20 in. in diameter, respectively, and air cylinders 11 and 18 in., with a stroke of 24 in. The capacity of each compressor is 700 cu. ft. of free air at a speed of 100 r.p.m.

The steam cylinders are provided with Meyer adjustable cut-off valves. The main steam valves are double-ported, permitting short ports and a consequent reduction of clearance. The high and low-pressure main steam valves are balanced to reduce friction and wear.

Both air cylinders are provided with mechanically operated inlet valves of the Corliss type, which are placed in the cylinder heads, permitting close clearance and large port area with consequent, free admission of air. These valves are actuated by the steam cut-off eccentrics, so that four eccentrics drive both steam and air valves, the valve gear being very simple for the work performed.

The discharge valves are of the poppet type, valves proper being of cup shape, pressed out of sheet steel. The valve seats and guides are removable and readily accessible for inspection or renewal.

An intercooler, not shown in the illustration, is provided between the high and low pressure air cylinders which cools the air after compression in the low-pressure cylinder

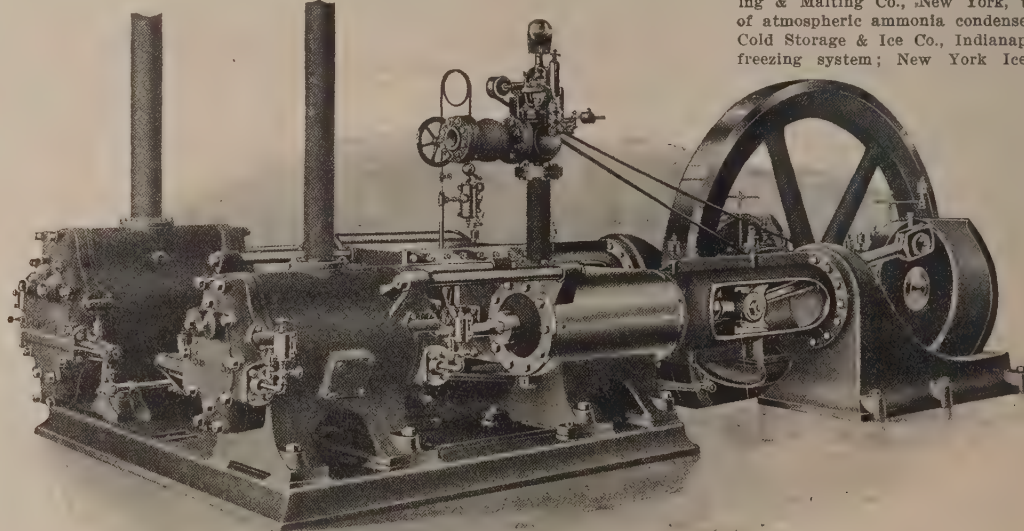
down to the temperature of the atmosphere. This intercooler, being self-contained, can be placed in any location desired.

The governor is furnished with a pressure regulator which brings the machine to a stop when the receiver pressure has reached a desired amount, starting it again automatically upon a slight drop in receiver pressure. The governor is also supplied with a safety stop which will prevent compressor from running away in case of accident to governor belt.

A rigid box section sole plate extends under the four cylinders, to which they are securely doweled, a feature which is of much help in setting the machine and maintaining its alignment.

BUSINESS NOTES.

At the annual meeting of the Bethlehem Steel Co. on Jan. 27 the following officers were elected: President, Edward M. McIlvain; vice-president, Adolph E. Borie; secretary and treasurer, Henry S. Snyder; general superintendent, Archibald Johnston; members of the board of directors, Charles M. Schwab, Max Pam and Joseph E. Schwab. It is understood that important additions to the plant will be made during the year. This company should not be confused with the Bethlehem Steel Corporation, the successor of the U. S. Shipbuilding Co., which elected the following officers on Jan. 19: President, Chas. M. Schwab; vice-president, E. M. McIlvain; secretary and treasurer, Henry S. Snyder; assistant treasurer, John A. McGregor; controller, B. H. Jones. The Corporation's offices will be at South Bethlehem, Pa.



THE NEW FRANKLIN AIR COMPRESSOR.

The A. S. Cameron Steam Pump Works, foot of East 23d St., New York City, report the sale of three more of their horizontal piston pumps to the O'Rourke Construction & Engineering Co., of New York, contractors for the Pennsylvania R. R. tunnel under the North River, delivery being made to the Manhattan side. The construction company also has quite a number of Cameron pumps in use on the Weehawken side of the tunnel, as well as along the line of the improvement in the New York Central R. R. in New York City.

The Berkshire Iron Works have bought two blast furnaces at Sheridan, Pa., and intend to put one of them in blast on foundry and mill irons as soon as it can be gotten ready.

The annual meeting of the Acme Road Machinery Co. was held on Jan. 20 at Frankfort, N. Y. The following directors were all re-elected: W. A. Cook, Frankfort; D. B. Cook, Frankfort; James Dempsey, Frankfort; James W. Jones, Frankfort; T. G. Ingersoll, Vernon; P. Pollock, Troy; A. Schaupp, Albany. The directors elected the following officers for the ensuing year: Philander Pollock, president; Alonzo Schaupp, vice-president; James W. Jones, secretary and treasurer; W. A. Cook, general manager; Jotham P. Allds, counsel. The business of the company for the past year has been one of the largest in its history, and the outlook for the ensuing year is very promising. A large number of orders have already been booked for spring delivery, and the works are running on full time. Mr. C. E. Hoag, of Quaker Street, N. Y., who has been with the Amer-

ican Road Machine Co. and the Good Roads Machinery Co. for the past sixteen years, has severed his connection with these companies, and has associated himself with the Acme Road Machinery Co. He will have charge of its sales department in the Hudson Valley and New York City. Mr. Chester A. Hoag, who has also been associated with the Good Roads Machinery Co. for the past four years, has also joined the traveling force of the Acme Co.

The O'Rourke Engineering Construction Co., of New York, has filed at Albany a certificate of increase of capital stock from \$1,000,000 to \$2,000,000.

The Union Iron Works Co., San Francisco, Cal., has been reincorporated with a capital of \$2,000,000. The directors are G. H. Sheldon, Pilny Flisk, J. E. Borne and Charles Wetmore, all of New York.

In equipping its new English shops, where the steel cars for the London Underground Railway are to be built, the American Car & Foundry Co. has purchased from the Ingersoll-Sergeant Drill Co. its entire pneumatic equipment, including air compressors and Haeseler hammers and drills.

The Niles, O., Corrugating Co. is erecting a building 150 ft. long and has bought machinery for the manufacture of black and galvanized steel and iron roofing sheet. The company expects to have a full line in the market Mar. 1.

A case of perfect satisfaction with roofing material is manifested by the decision of the Tiffany Co., the famous New York jewelers and workers in precious metals, to use the same materials on the foundation walls, cel-

lar floors and roof of their new building that were employed 36 years ago in the construction of their well-known building in Union Square. These materials were furnished by the Barrett Mfg. Co.

The Elevator Air Brake Co., Chatham, Columbia Co., N. Y., has been incorporated with a capital of \$250,000. The directors are Le Roy Clark, Alfred H. Meech and T. H. Leberman, of New York.

The York Mfg. Co., York, Pa., reports the following among recent contracts: C. E. Wright Ice & Coal Co., Greenwood, Miss., 25-ton ice-making plant; Fort Schuyler Brewing Co., Utica, N. Y., 20-ton compression side with brine cooling and piping outfit; Morgenthaler Bros., Philadelphia, 60-ton ice-making plant; Tulsa, Ind. T. Ice Co., 15-ton ice-making plant; Norton, Kan., Ice, Light & Cold Storage Co., 25-ton ice-making plant; Emigsville Creamery Co., York, Pa., 10-ton refrigerating and ice-making plant; Danville, Ill., Artificial Ice Co., 65-ton compression side; Blumer & Sartain, Columbus, O., 20-ton refrigerating machine with direct expansion piping; David Wilson, Carlinville, Ill., 10-ton ice-making plant; Ekenberg Milk Products Co., Cortland, N. Y., through Westerberg & Williams, New York, 10-ton refrigerating machine; Hank Bros., Monongahela, Pa., 5-ton ice-making plant; Childs Unique Dairy Co., New York, 10-ton refrigerating plant; Columbus, O., Savings & Trust Co., 10-ton refrigerating plant; Colorado Ice & Storage Co., Denver, 150-ton freezing and distilling system; Westerlin & Campbell Construction Co., Can-

ton, Miss., 75-ton ice-making plant for the Mississippi Co.; Hazlewood Brewing Co., Pittsburgh, 65-ton refrigerating machine; Thos. J. Kurlde, Highlandtown, Md., 30-ton refrigerating plant; Bauman Mfg. Co., Youngstown, O., 20 and 10-ton refrigerating machines and brine coolers and piping; H. Wegener Brewing Co., Salt Lake City, 40-ton refrigerating machine and direct expansion piping; Klages Coal & Ice Co., 35-ton ice-making plant; Montrose, Colo., Electric Light & Power Co., 40-ton refrigerating machine. 15-ton ice-making plant and piping for cold storage; Theo. A. Hale, Water Valley, Miss., 10-ton ice-making plant; Consumers' Ice Co., Roanoke Va., 25-ton ice-making plant; Clarkdale, Miss., Ice & Bottling Works, 15-ton ice-making plant; Cooley's Hotel, Springfield, Mass., 10-ton refrigerating plant; Clearfield, Pa., Brewing Co., 30-ton compression side with 12-ton freezing and distilling system; Smight & Horton Co., Warren, Pa., 30-ton refrigerating plant; Peters Packing Co., Me. Keesport, Pa., 20-ton compression side; Swift & Co., Brooklyn, N. Y., 65-ton refrigerating plant; Logan & Morris, Richmond, Ky., 35-ton ice-making plant; H. L. Handy & Co., Springfield, Mass., 10-ton refrigerating plant; Sweets & Cofer, Elizabethtown, Ky., 10-ton compression side and distilling system; M. Chrissifidis, Piree, Greece, 6-ton ice-making plant; Pennsylvania Cold Storage & Market Co., Philadelphia, four 60-ton shell type brine coolers; C. C. Weinlauf, Pittsburg, 6-ton refrigerating plant; Old Dominion Brewing & Ice Co., Newport News, Va., 30-ton freezing and distilling system; Hamilton Ice Mfg. Co., Camden, N. J., vertical single-acting compressors on two machines; Kipps Bay Brewing & Malting Co., New York, twelve coils of atmospheric ammonia condenser; Western Cold Storage & Ice Co., Indianapolis, 75-ton freezing system; New York Ice Co., New

York, vertical single-acting compressors; Roessle Brewing Co., Boston, 7,000 ft. direct expansion piping; New York Butchers' Dressed Meat Co., 12,000 ft. direct expansion piping; P. Ballentine & Sons, Newark, N. J., single-acting compressors for three machines; Border City Ice & Coal Co., Van Buren, Ark., 4-ton freezing and distilling system; Armour Packing Co., Kansas City, Mo., 33,000 ft. direct expansion piping; Ferd. Helm Brewing Co., Kansas City, Mo., 32 coils double pipe ammonia condenser; Monongahela, Pa., Brewery, 6-ton freezing and distilling system; Jos. Stern & Son, New York, single-acting compressors for two machines.

S. F. Alden & Co., Rialto Bldg., San Francisco, Cal., Pacific coast agents for the Davis & Farnum Mfg. Co., of Waltham, Mass., report the sale of three steel gas-holders, with a total capacity of 1,400,000 cu. ft., to the California Gas & Electric Corporation. The shipping weight of these holders will exceed 2,000,000 lb., or about fifty carloads. The contract price approximates \$125,000. These holders are a part of the equipment for the generation of power to operate the United Railroads' system.

The American-German Construction Co., of Savannah, Ga., of which Mr. E. C. Hemmer is general manager, states that it is now successfully running several old-type turpentine plants, remodeled to permit the use of its process. This is stated to yield by extraction methods a turpentine as uniform in quality as gum spirits, and furnish at the same

crude acetone, crude acetate of lime, and ter-free medium liquid tar. A description of the company's process can be obtained from Dr. Henry Sundheimer, Savannah, Ga.

The Vulcan Iron Works, Wilkesbarre, Pa., received orders for 7x100-ft. rotary for a new cement plant at Speeds, Ind., by J. B. Speed & Co., Louisville, Ky. also have orders for 7-ft. kilns 110 ft. for the Lawrence Cement Co., Siegfried, Pa. There is an increasing demand from rent parts of the country for kilns 100 and longer, and a great many of the old are lengthening out their present 60 70-ft. kilns. The Works have very large increased their export business in light motives in the last year. At the present they have orders for Honduras, Cuba, Rico, the United States Navy Yards at on and League Island, Midvale Steel and a number of contractors' railways the Mesabe Range district.

The Carnegie Steel Co. is in receipt of a large and increasing volume of orders which probably equals its previous records. Its business includes merchant sizes, shapes, structural and bridge materials, billets, and all kinds of product; the prices satisfactory, and the prospect is for a continued healthy demand.

The 1905 plans of the New York Metal ing Co., 537, 539, 541 West 24th St., New

Mr. Clarence H. Blackall, of Boston, delivered a lecture, illustrated with lantern slides, before the Brooklyn Institute of Arts and Sciences, Jan. 31, on theater architecture.

Mr. Wm. Copeland Furber, architect and consulting engineer, has moved from the Philadelphia Bank Building to the Commercial Union Building, 420 Walnut St., Philadelphia.

At a recent meeting in Milwaukee of some of the members of the staff of the Allis-

39, H. Schiffin; 40, J. A. Milne, comptroller; 41, H. S. Pell; 42, G. S. De Weir; 43, H. J. Holden; 44, M. J. Furlong; 45, George T. Thomas; 46, W. E. Dodds, superintendent of construction; 47, Richard Hoppin; 48, H. C. Helvey; 49, Albert Hoppin; 50, A. J. Gates, superintendent Chicago works No. 1; 51, George L. Fisher; 52, W. N. Tanner; 53, Richard Barnard; 54, F. W. Greenleaf; 55, H. S. Mallalieu; 56, H. I. Keen; 57, J. O. Watkins; 58, R. J. Glendenning; 59, G. F. Collins; 60, R. D. Tomlinson; 61, C. A.

Mr. R. C. Strachan, assistant engineer of the Department of Bridges of New York City, will read a paper on "The Computation of Stresses in the Blackwell's Island Bridge" Feb. 9, before the Brooklyn Engineers' Club.

An examination will be held in various cities on March 15 by the U. S. Civil Service Commission, of candidates for positions as engineering and hydrographic aid in connection with the construction of irrigation works in the West.

Major Villiers Sankey, city surveyor of Toronto, Canada, has resigned to accept a position on the engineering staff of the Grand Trunk Pacific Ry. He will have charge of exploration work in the district between Winnipeg and Lake Nepegon.

Mr. F. H. Bainbridge, engineer of bridges of the Illinois Central R. R., has resigned to become principal assistant engineer of the Chicago & Northwestern Ry., succeeding Mr. W. H. Finley, who recently resigned to engage in private practice in Chicago.

Mr. Charles B. Colby, Philadelphia, formerly president of the Dauphin Bridge Works, has accepted the position of superintendent of erection for the American Structural Steel Co., Pittsburg Pa., and will have headquarters for the present at 1183 Broadway, New York.

Mr. George H. Bliven, of Greenville, N. C.,



SOME OF THE OFFICERS, DEPARTMENT HEADS, AND REPRESENTATIVES OF THE ALLIS-CHALMERS CO.

rk City, include a more than doubled capacity for the output of "Enamette." The company anticipates a largely increased business on all products, and believes its preparation for "Enamette" will be fully taxed. The results with this wall finish have been satisfactory, and hence the necessity for a very increased production.

PERSONAL NOTES.

Mr. William B. Shafer, Jr., has recently joined the National Bridge Co., with offices at 1123 Broadway, New York.

Mr. Wm. Pierson Judson, consulting engineer of Oswego, N. Y., will be temporarily located during 1905 at Broadalbin, Fulton Co., N. Y.

Naval Constructor H. L. Ferguson, U. S. N., has resigned, and it is reported that he has accepted a position with the Newport News Shipbuilding Co.

Mr. Preston H. Porcheron has been appointed city engineer of Rome, N. Y., and Mr. William H. Brodock, superintendent of highways outside of the corporation.

Mr. E. P. Goodrich addressed the Brooklyn Engineers' Club on Feb. 2 on the freight-handling system of the Bush Terminal Co., New York, of which he is chief engineer.

Chalmers Co. the accompanying photograph was obtained. The general interest in this latest of great power specialist corporations lends particular value to the picture of this group, which is made up of the following gentlemen: 1, James Tribe; 2, G. C. Forgeot; 3, A. Neidermeyer; 4, W. J. Sando, manager pumping engine department; 5, W. H. White-side, general manager of sales; 6, W. J. Chalmers, vice-president and treasurer; 7, B. H. Warren, president; 8, A. M. Mattice, chief engineer; 9, Arthur Warren, manager of publicity; 10, B. A. Behrend, chief engineer of electrical department; 11, C. C. Tyler, general superintendent; 12, W. M. S. Miller; 13, Ervin Dryer; 14, F. F. Coleman; 15, James Ashworth; 16, H. A. Allen; 17, W. W. Nichols, vice-president and secretary; 18, J. F. Harrison, manager flour mill machinery department; 19, Almon Emrie, superintendent Milwaukee works; 20, W. G. Starkweather; 21, J. R. Jeffrey; 22, C. J. Printz; 23, H. S. Mitchell; 24, I. L. Skeith; 25, G. C. Henry; 26, Robert Mulford; 27, J. C. Buckbee; 28, H. Woodland, assistant treasurer; 29, Clemens Herschel, manager hydraulic turbine department; 30, C. A. Burns; 31, H. L. Wells; 32, Franklin Wharton; 33, H. V. Croll; 34, G. L. Tiff; 35, J. D. Millar; 36, W. C. Trout; 37, M. C. Miller; 38, W. A. Wood;

Derby; 62, G. A. Berg; 63, J. C. M. Lucas; 64, W. O. Everett; 65, H. A. Hammil; 66, D. T. Jones.

Major Hugh Gallagher has been appointed purchasing officer of the Isthmian Canal Commission, and will have charge of all contracts for the supplies furnished for work on the canal.

It is understood that Mr. George W. Riter has been appointed city engineer of Salt Lake City, Utah, to succeed Mr. George W. Snow, whose resignation was mentioned in this column last week.

Mr. R. S. Fuller, formerly engineer of Pueblo County, Colo., has been employed by eastern capitalists to carry out the construction of extensive irrigation and water works systems in Honduras.

Mr. E. G. Lane has been appointed division engineer of the Baltimore & Ohio R. R. at Newcastle, Pa., to fill the vacancy caused by the recent resignation of Mr. J. B. Cameron, noted in this column Jan. 28.

Mr. Edmund M. Blake, of Newton, Mass., has sailed for Italy, and, while there, will inspect some of the drainage and irrigation works in that country in the interests of the U. S. Department of Agriculture.

has been appointed general manager of the Rochester & Lake Ontario Water Co., Rochester, N. Y., to succeed Mr. George K. M. Clarke, who will hereafter act in an advisory capacity to President Mingle, of that company.

Mr. Chas. E. Wells, formerly with the engineering corps of the Metropolitan Water & Sewerage Board, Boston, has been appointed construction engineer in charge of the building of the Pathfinder dam on the North Platte River in Wyoming, for the U. S. Reclamation Service.

Mr. I. M. De Varona, chief engineer of the Department of Water Supply, Gas and Electricity of the Borough of Brooklyn, New York City, has been appointed acting chief engineer of the Department of Water Supply of New York City. Mr. De Varona assumed his new duties Feb. 1, but will retain his former position as chief engineer of the department of the Borough of Brooklyn.

Mr. Albert Carr, division engineer of the New York Rapid Transit Commission, has resigned to accept the position of manager of construction for the Mexican Light & Power Co., 29 Broadway, New York. He has sailed for Necaxa, Mexico, to superintend the construction there, which includes the con-

struction of a large dam. The work recently completed in New York by Mr. Carr included the construction of the City Hall loop of the rapid transit subway.

Mr. L. G. Morphy has been appointed to succeed Mr. E. F. Van Hoesen, as resident engineer of the western district of the New York Central & Hudson River R. R., with headquarters at Buffalo, and his work will include grade crossing elimination on that division, being in that respect a continuation of the lines on which he has been engaged in New York. Mr. Van Hoesen's resignation to become deputy state engineer of New York was mentioned in these columns Jan. 14.

Messrs. J. A. McGrew and H. D. Bruning have formed a partnership under the firm name of McGrew and Bruning, and will open an office in the Brunson Block, Columbus, Ohio, as consulting and constructing engineers. Mr. McGrew was formerly engineer of maintenance of way on the eastern division of the Pittsburg, Ft. Wayne & Chicago Ry. Mr. Bruning was also formerly connected with the engineering department of the Pennsylvania lines, and for the past two years has been Assistant Professor of Civil Engineering at Ohio State University.

Recent additions to the board of directors of the Illinois Tunnel Co., which will operate the underground freight railway system at Chicago, include the following: Pres. A. J. Earling of the C. & St. P. Ry.; Pres. E. P. Ripley of the Santa Fe system; Pres. George B. Harris of the Burlington system; Pres. B. L. Winchell of the Rock Island system; Vice-Pres. J. Kruttschnitt of the Harriman system; Pres. S. M. Felton of the Chicago & Alton; Vice-Pres. A. C. Bird of the Gould system; Pres. F. D. Underwood of the Erie R. R.; Pres. Benj. Thomas of the Chicago & Western Indiana R. R.; P. A. Valentine of Armour & Co.; Albert G. Wheeler, who has been elected president of the company.

Mr. James Christie has resigned from the position of chief mechanical engineer of the American Bridge Co., but will retain a close connection as its consulting mechanical engineer. He became chief mechanical engineer for the Pencoyd Iron Works in 1876, and continued in that position until the formation of the American Bridge Co. He has designed the greater part of the mechanical installations at the Pencoyd and Ambridge plants, and has built numerous notable hydraulic machines of great capacity, some of which have been described by The Engineering Record in the articles on the Pencoyd and Ambridge works. A full sketch of his professional career was printed in this journal on Nov. 28, 1903.

Rear-Admiral Geo. W. Melville, U. S. Navy, read an interesting paper before the American Society of Mechanical Engineers on Jan. 31, discussing, historically, the advances made in mechanical engineering on shipboard, under the title: "Epochs in Marine Engineering." The presentation of the paper was preceded by an announcement that Col. Edward R. Archer, chief engineer of the Tredgar Co., of Richmond, Va., had presented to the society, as a contribution to its museum, a portion of the turret of John Ericsson's monitor "Montauk," showing, by a sizeable dent, its impenetrability by the ammunition of its day. President Freeman said that the next meeting would be held on Feb. 28, when it was expected that Dr. Barnes, of McGill University, would describe his investigations of frazil ice, in connection with which he has made temperature measurements of great refinement.

Mr. W. N. Stevens, who has for some time filled the position of assistant mechanical engineer of the Rapid Transit Subway Construction Co., has accepted a position with J. G. White & Co., 43 Exchange Place, New York City. Mr. Stevens has had a wide experience as a constructing engineer in the design and active construction of important power plants. He had much to do with such work on the 12th St. power house of the New York Edison Co., and also the 74th St. power house; he has lately been engaged on the work of designing and building the 59th St. power house, nine transformer stations, car barns, shops, and other adjuncts to the construction and equipment of the Rapid Transit R. R. in New York. During his professional career, Mr. Stevens has also been engaged in engineering undertakings in other parts of this country and abroad, having made both the preliminary and final plans for the machinery of the power house for the tramways of Sydney, Australia.

CONTRACTING NEWS

OF SPECIAL INTEREST TO

CONTRACTORS, BUILDERS, ENGINEERS
AND MANUFACTURERS

OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Uniontown, Ala.—See "Power Plants, Gas and Electricity."

Santa Rosa, Cal.—City Engr. L. E. Ricksecker has completed and presented to Council the following report on water works improvements: For distributing pipes in the city, \$12,608; 16-in. pipe from pumping station to the reservoir, \$9,102; 12-in. pipe from pumping station to corner of 4th & E Sts., \$14,650, and cover for reservoir, \$800; total, \$37,160.

Montrose, Colo.—Frank L. Ross, Deputy City Clk., writes it is proposed to construct water works at a cost of \$100,000, but nothing definite has yet been done. C. Henderson, of Montrose, is trustee.

Fort Logan, Colo.—Col. C. A. H. McCauley, Q. M. U. S. A., Ft. Logan, writes that Edwin B. Hendrick, 1635 17th St., Denver, has secured the contract for an 80-hp. return tubular boiler, and 27,000-gal. steel receiving water tank at this post (bids opened Jan. 28) for \$3,807.

Meeker, Colo.—W. H. Clark, Town Engr., writes that bids are wanted Mar. 4 for the construction of a gravity system of water works, to cost about \$60,000.

Washington, D. C.—Bids are wanted Feb. 20, for furnishing c. l. pipe specials for siphons, as advertised in The Engineering Record.

Cairo, Ga.—See "Power Plants, Gas and Electricity."

Toccoa, Ga.—John W. Owen, Mayor, writes that only preliminary surveys have been made for the construction of water works. No engineer selected as yet.

Dallas, Ga.—The Dallas Light, Water & Power Co. is stated to be considering the construction of water works.

Decatur, Ga.—The question of issuing bonds for the construction of water works and a system of sewerage is reported under consideration.

Ooltic, Ind.—The citizens are reported to have voted Jan. 22 to construct water works.

Sioux City, Ia.—The Bd. of Water Works Trusts are stated to have recommended that the pumps be lowered and some new mains and hydrants installed at a cost of about \$30,000.

Dawson Springs, Ky.—The question of constructing water works here is reported under consideration.

Ft. Preble, Me.—Bids are wanted Feb. 23, for extending water mains at this post. Capt. A. W. Yates, Q. M., U. S. A., 187 Middle St., Portland.

Lawrence, Mass.—The Water Bd., in its annual report to Council, recommends that immediate steps be taken toward providing an adequate water supply.

Flint, Mich.—The Water Comrs. are stated to have decided to construct a 12-in. main from the pumping station to the business and manufacturing district of the city.

Kalamazoo, Mich.—Press reports state that bids are about to be asked on water pipe for the city for this year.

Hastings, Minn.—The plans of O. F. Doyle, of St. Cloud, are reported to have been accepted for water works for Hastings.

Minneapolis, Minn.—The City Council has decided to petition the State Legislature for permission to issue \$1,000,000 bonds for the construction of a filtration plant.

St. Louis, Mo.—The Bd. of Pub. Improv. is reported to be co-operating with Water Comr. Ben C. Adkins in drafting an ordinance authorizing the expenditure of \$200,000 for 17 miles of new water mains.

Cassville, Mo.—Burns & McDonnell, 509 Dwight Bldg., Kansas City, Mo., are preparing plans and specifications for water works for Cassville. Bids for \$9,000 water-works bonds will be received March 1. E. C. Frost, Mayor.

Sedalia, Mo.—See "Power Plants, Gas and Electricity."

Laurel, Mont.—The Cove Ditch Co. is reported incorporated, to purchase, extend, enlarge and maintain the irrigating ditch or canal of the Yellowstone Ditch Co., in the county of Yellowstone, which now takes its water supply from the north bank of the Yellowstone River. The principal place of business is Laurel. Directors: W. B. Westbrook, W. L. Allard, of Laurel; Chas. O'Donnell, of Billings, and others.

Glendive, Mont.—H. J. Halvorson, City Clk., writes that the proposed water works will cost \$40,000. Engineer, Edw. S. Baer.

***Osceola, Neb.**—The Drake-Williams-Mount Co., Omaha, is reported to have secured the contract for constructing a stand-pipe for the water system, at \$4,377.

Charlestown, N. H.—The Charlestown Water & Sewerage Co. is stated to have petitioned Legislature for a charter.

Stratford, N. H.—The Coos & Essex Water Co. is stated to have petitioned Legislature for a charter.

Trenton, N. J.—The Water Comrs. are stated to have decided to lay a 24-in. main from State St. to a point below the canal bridge at S. Broad St. About 300 tons of pipe will be required.

Butler, N. J.—The Butler Water Co., of Butler, N. J., is reported incorporated to build in Butler, capital, \$20,000. Incorporators: John R. Thompson, Amenia, N. Y.; Arthur A. Tanner, Waterbury, Conn.; Wm. M. Drew, Paterson, N. J., and others.

Atlantic City, N. J.—The Water Comrs. in their annual report are stated to have recommended the establishment of a city reservoir. Kenneth Allen, Engr. & Supt.

Highlands, N. J.—See "Power Plants, Gas and Electricity."

Raton, N. M.—A. L. Hobbs, Supt. Raton Water Wks. Co., writes that the following are the bids recently received for 21,500 ft. 12-in. wooden stave pipe, including trenching and backfilling (price given per ft.): Phillips Constr. Co., Raton, \$1.13; Holmes & Allen Constr. Co., Denver, Colo., \$1.33, and T. J. Murphy, Trinidad, Colo., \$1.19. Bids were also received from the Pacific Coast Pipe Co., of Ballard, Wash., on another contract of 12,000 ft. 12-in. machine-banded pipe at 75 cts. per ft.

Buffalo, N. Y.—Henry L. Lyon, Deputy Water Comr., writes that the only bid received and opened on Jan. 24, for constructing a crib at Massachusetts Ave. was received from the Buffalo Dredging Co., D. S. Morgan Bldg., for \$22,500.

New York, N. Y.—The Board of Estimate has authorized the Croton Aqueduct Commission to construct as soon as possible two additional reservoirs in the Croton basin, plans of which have been outlined by Ch. Eng. J. Waldo Smith. The Board has also requested from the Corporation Council an opinion concerning the right of the mayor to appoint, without legislative consent, a commission to take charge of the construction of the works for the proposed additional water supply. The mayor already has a bill before the Legislature to give him this right by direct legislation.

Ft. Casswell, N. C.—Bids will be received March 21 for sinking a 6-in. tubular deep well, here, as advertised in The Engineering Record.

Canton, O.—The plans of Archt. J. M. Bostick of Massillon, are stated to have been accepted for the erection of a pumping station at Canton, to cost \$25,000.

Elyria, O.—L. W. Griffin, City Engr., writes that it is proposed to purchase a 5,000,000-gal. pump, to cost about \$22,000. Geo. L. Weller, Supt. Water Wks.

Springfield, O.—W. H. Ferguson, Supt. Water Wks., in his annual report to Council, is stated to have recommended the extension of water mains on numerous streets and the installation of a 20-in. valve at Main and Center Sts., and the repairing of other valves.

Cedarville, O.—Robt. Hood, Consulting Engr. Cedarville Water Works Co., writes that it is proposed to construct water works, at a cost of \$35,000.

Coldwater, Mich.—The following are the bids opened on Jan. 26, by the Bd. of Pub. W. (Chas. G. Moore, City Engr.), for the construction of sanitary sewers; material to be used is loose gravel and sand—no quicksand; one-half the length, ground water from 2 to 4 above grade will be encountered: (a) Stitt & Kunse, Wabash, Ind.; (b) National Constr. South Bend, Ind.; (c) Northern Constr. Co., Elkhart, Ind.; (d) Shannon & Callahan, Jo. Ill.; (e) J. H. Green & Sons, Appleton, Wis.; (f) H. F. Liphard, 720 14th Ave., Detroit.

	a.	b.	c.	d.	e.	f.
360 in. ft. 24-in. (on embankment) ..	\$1.43	\$1.80	\$2.50	\$1.50	\$1.75	\$1.75
2,716 " 15-in.	4.10	3.50	3.50	4.05	3.52	3.52
2,940 " 15-in.	3.26	4.25	3.75	3.45	3.45	3.45
3,060 " 12-in.	2.57	2.30	2.50	3.25	3.05	3.05
1,000 " 10-in.	1.78	1.55	1.75	2.56	1.98	1.98
20 manholes, complete with cover	37.00	55.00	75.00	55.00	45.00	45.00
Concrete, per cu. yd.	...	7.50	6.00	15.00	8.50	8.50
Embankment, per cu. yd.	...	27	40	75	75	75
Total	\$31,619	\$28,662	\$33,801	\$36,170	\$32,546	\$34,000

Bucyrus, O.—This city will probably install a filtration plant within 6 months.

Wanette, Okla. Ter.—See "Power Plants, Gas and Electricity."

Pittsburg, Pa.—Bids will be received by the Bureau of Filtration (Mayor Wm. B. Hays, Chmn.) at the office of the City Controller, Municipal Bldg., on Mar. 8, for the construction of the necessary work in connection with the proposed sand filtration system and appurtenances, as advertised in The Engineering Record; probable cost of the work is \$6,000, 000.

Deadwood, S. D.—A. D. Wilson, City Engr., writes bids were opened Jan. 25 for constructing water works, consisting of about 12 miles of gravity supply pipe, distributing reservoir, etc. They were all lump sum bids, as follows: Jas. Munn, Deadwood, \$119,000; Edw. Hanshka, Deadwood, \$124,400; P. McDonnell, Duluth, Minn., \$123,800; Flinn & Hanlan, Sioux City, Ia., \$119,875; American Light & Water Co., Oklahoma, Okla. Ter., \$117,778; McQuatters Plumbing & Machine Co., Hillsboro, Tex., \$117,990, and Hanley & Ritchie, Iola, Kas., \$116,900.

Chattanooga, Tenn.—The House is reported to have passed the bill providing for the issue of \$750,000 bonds for the purchase of the present water works or the construction of municipal water works.

Nashville, Tenn.—City Engr. J. M. Lewis is reported to have recommended the lowering of the Main St. pumps, at a cost of \$16, 139.

Johnson City, Tenn.—See "Power Plants, Gas and Electricity."

Ft. Worth, Tex.—The City Council is stated to have passed an ordinance in favor of sinking additional wells and the construction of conduit to the pumping station.

Seattle, Wash.—See "Paving and Roadmaking."

Milwaukee, Wis.—The Water Works Co. of Council is stated to have decided to extend the 12-in. main in the 23d Ward from North Ave. high pressure station, a distance of about a mile, at a cost of bet. \$12,000 a \$15,000.

***Milwaukee, Wis.**—The contract for building an electric traveling crane for the Point pumping station (bids opened Jan. 2) has been awarded to Pawling & Harris, feger, of Milwaukee, for \$4,250. The other bid submitted was from the White Fdy. Equipment Co., of Harvey, Ill., at \$5, 000.

Cody, Wyo.—Press reports state that Big Horn Basin Development Co. is about to ask for bids for the construction of an irrigation system. Water will be taken from Shoshone River, just below Cody, and transported in a canal 28 miles long to the Oregon bar which will be used for storage purposes. By this reservoir three canals having a combined length of 120 miles will be built, carrying water over 215,000 acres of land between Shoshone and Grey Bull Rivers: the cost of construction will be about \$2,000,000.

Vancouver, B. C.—Thos. F. McGuigan, C. Clk., writes that the citizens voted Jan. 1 in favor of issuing \$140,000 bonds for tending the water mains.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

San Diego, Cal.—G. A. d'Hemecourt, C. Engr., is stated to have completed plans a sewerage system for La Jolla.

***Washington, D. C.**—Later reports state that the Savage Fire Brick Co., of Johnstown, Pa., has secured the contract for furnishing 600,000 brick for delivery in Washington, to be used in sewer construction, at \$16.50 M.

Atlanta, Ga.—Ordinances have been introduced in Council providing for appropriation of \$25,000 for extending the Butler St. sewer and \$25,000 for extending the Orme St. sewer.

Decatur, Ga.—See "Water."

Sullivan, Ind.—It is stated that bids will be received until Feb. 16 for constructing several sewers. Wm. E. Aydelotte, Pres. Trusts; David Crawley, Town Clk.

***Tola, Kan.**—Henley & Ritchie are reported to have secured the contract for constructing sewers in Sewer Dist. No. 9, for \$14,000.

Baltimore, Md.—At a recent meeting of Sewerage and Annex Loan Com. (Frank Furst, Chmn.), the following are among recommendations for the proposed sewerage system that were adopted: That the system be constructed for a population of at least 1,000,000; that it cost not more than \$1,000,000; and that the sewage be treated biologically.

Fitchburg, Mass.—Press reports state that the City Council has decided to begin at once the construction of a sewage disposal system and to complete the work within 7 years.

***Bay City, Mich.**—The following are bids opened on Jan. 23 by the Bd. of Pub. Wks., for constructing 2,285 ft. of 26x36 egg-shaped brick sewer, on Belinda St., average depth, 7 ft.: P. Ryan, \$3,150 (award contract); P. Dwyer & Co., \$3,690; Dons & Wolfe, \$3,434, and F. Osborn & Co., \$3, 600.

Lansing, Mich.—The following are the bids opened on Jan. 30 for constructing sewer in Pine, Madison and other streets (bid No. 1 of Lansing): John H. Algate, \$24, 000; Geo. H. Kneal, \$24,735, and M. E. Fitchrick, \$24,800. The work consists of 23 20x30-in. brick sewer, 245-ft. 22x33-in. sewer, 4,299-ft. 42x63-in. brick sewer, 42 12-in. glazed pipe sewer, 10 manholes and catch basins.

St. Paul, Minn.—The lowest bid opened Jan. 23 for constructing sewers in Palace, Astoria, James and Milton Sts. is stated to have been submitted by E. J. Kirkland, for \$7, 000.

Gulfport, Miss.—H. D. Moore, Mayor, writes that it is proposed to construct a sewerage system at a cost of \$26,000. Contracts be let in about 2 months. Engineer, C. Foster.

Meridian, Miss.—The city on Jan. 20 bonds to be used as follows: \$35,000 sewer extension; \$60,000 for paving, \$40,000 for sidewalk construction. Jas. Rivers, Mayor.

Holly Springs, Miss.—The citizens voted Jan. 23 in favor of constructing a sewerage system with disposal works to cost \$19, 000. Kirkpatrick & Johnson, of Jackson, have engaged to prepare the plans.

*Items marked thus give the names of parties awarded contracts.

Louis, Mo.—Bids will be received Feb. 1 by the Bd. Pub. Improv., for constructing sewers in several Sewer Districts, embracing 13-14 ft. 12, 15 and 18-in. pipe sewer, 1,070 ft. 12 ft., 330 ft. 20x30 in. 145 ft. 3x4 1/2 ft., 16 ft. 2 3/4 ft., 1,210 ft. 2x3 ft., 1,915 ft. 2 3/4 in., 1,085 ft. 20x30 in. and 414 ft. 2 ft. brick sewer. Waller Edwards, Secy.

ansas City, Mo.—A board of Freeholders is raffing a new charter for Kansas City. It will make a number of changes in its ent system; it will provide a means of ining money by bonds or 20-year certifi- to build some of the large outlying sewers. This board is to report Feb. ad the election will be held in March.

Omaha, Neb.—W. P. Adkins, Pres. Council, writes that a bill has been in- uced in legislature providing for the issue 250,000 sewer bonds and the city is now aring plans and specifications for the pro- ing sewerage system. Frank Koutsky, or.

Stratford, N. H.—See "Water."

ersey City, N. J.—Bids will be received y 6 by the Bd. Street and Water Comr. for structing a relief sewer in a portion of ount Ave. Estimate of quantities: 100 lin. ft. 48-in. circular brick sewer, 100 cu. yds. rock excavation, 10 M. ft. nathing, etc. Geo. T. Bouton, Clk.

amaroneck, N. Y.—Bids will be received the Village Bd. of Trus. until Feb. 17 for structing 3 1/2 miles of sewers. Chas. W. kter, Village Clk.

uburn, N. Y.—The estimated cost of the posed trunk sewer for the 4th, 5th, 6th and wards, including disposal works, from us prepared by Geo. S. Pierson, of Kalama- , Mich., and J. Walter Ackerman, City gr., is reported to be \$135,000. The dis- al works alone would cost \$30,000. Plans e been forwarded to Daniel Lewis, State alth Comr., at Albany.

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, es. Bronx Boro., for constructing sewer and appurtenances in W. 223d St. and on Bailey e; (a) W. J. Ford, 17 W. 103d St.; (b) Jas. Pilkington, Ft. Washington Park; (c) Briggs McLaughlin, 19 E. 130th St.; (d) Burns & Rodgers, 1909 Amsterdam Ave.:

	a.	b.	c.	d.
56 lin. ft. 4-ft. 9-in. brick sewer.....	\$20.00	\$20.00	\$27.00	\$23.00
103 " 4-ft. 6-in. " " " " " " " "	15.00	16.50	15.00	16.00
171 " 4-ft. " " " " " " " "	15.00	16.50	14.00	12.00
43 " 18-in. pipe sewer.....	6.00	5.00	4.00	6.00
120 " 15-in. " " " " " " " "	4.50	4.00	3.00	5.00
52 " 12-in. " " " " " " " "	4.00	3.50	3.00	4.00
270 spurs for house connections.....	1.00			1.00
29 manholes.....	50.00	70.00	65.00	80.00
525 cu. yd. rock excavated and removed	4.00	3.00	3.00	3.00
25 " concrete in place.....	4.00	5.00	3.00	...
25 " rubble masonry in mortar.....	4.00	5.00	3.00	...
1,000 " broken stone for foundations.....	3.00	1.50	1.00	...
50 M. ft. timber for foundations.....	40.00	25.00	...	...
500 lin. ft. piles below sills.....	.40	.01	...	...
50 " 12-in. drain pipe.....	1.00	...	...	...
Total.....	\$38,498	\$32,634	\$30,189	\$30,551

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, es. Bronx Boro., for constructing sewer and appurtenances in Boston Road, bet. Southern ular and E. 177th St.: (a) W. F. Murray, 1155 Boston Road; (b) Geo. I. Bailey, 168th t. and Fulton Ave.; (c) Bellev & Merritt Co., Tuckahoe, N. Y.; (d) W. J. Ford, 17 W. 103d ; (e) Briggs & McLaughlin, 19 E. 130th St.:

	a.	b.	c.	d.	e.
116 lin. ft. 18-in. pipe sewer.....	\$6.50	\$6.50	\$5.05	\$7.00	\$5.00
948 " 15-in. " " " " " " " "	5.50	5.00	4.00	6.00	5.00
184 " 12-in. " " " " " " " "	4.50	4.00	3.68	5.00	5.00
166 spurs for house connections.....	1.50		5.95	1.00	...
32 manholes.....	65.00	70.00	92.70	50.00	70.00
8 receiving basins.....	170.00	300.00	75.00	150.00	200.00
200 cu. yd. rock excavation and removal	3.50	3.00	3.30	4.00	5.00
8 M. ft. timber for foundation.....	40.00	10.00	40.00	30.00	...
Totals.....	\$34,945	\$30,237	\$31,196	\$36,636	\$36,080

New York, N. Y.—The following are the bids ened on Jan. 24 for constructing sewers and purtenances (a) Ft. Independence St. bet. alley and Heath Aves.; (b) Parkview Pl. rom Tew-Taw Ave. to W. 190th St.; Bellev & Merritt Co., Tuckahoe, a, \$11,838; b, \$11,142; (c) Jos. Grogan, a, \$11,326; W. J. Ford, 17 W. 103d St., a, \$12,724; b, \$12,377; Briggs & McLaughlin, 19 E. 130th St., a, \$12,682; b, \$11,563; James Pilkington, Ft. Washington Park, a, \$12,557; Burns & Rodgers, 1909 Amster- am Ave., a, \$11,162; J. H. Kerrigan, 2016 Arthur Ave., a, \$13,202; b, \$13,102; J. Good- e, b, \$11,373; F. W. Molloy, New Rochelle, a, \$10,471; b, C. Redmond & Co., b, \$11,284; Geo. M. Dunn, 737 E. 171st St., b, \$11,987; Geo. Murray, 1871 Jerome Ave., b, \$9,890.

Ellendale, N. D.—D. Cuyler Washburn, of Aberdeen, S. D., has completed the prelim- inary survey for a sewerage system for Ellende.

Dayton, O.—Contracts for constructing sewers in two portions of Dist. No. 4 (bids opened Jan. 20) are stated to have been awarded to Wm. Rehling, for a total of \$11,245.

Marion, O.—It is reported that bids will be received until Feb. 15 for furnishing material and constructing sewers in several streets. Wm. Fies, Clk. Bd. Pub. Service.

Toledo, O.—The following are reported to be the bids opened by the Bd. of Pub. Service on Jan. 9, for constructing a sewer on Columbus Ave.: Bodette & Sheehan, \$87,747; Henry P. Streicher, \$88,410; Thomas McKinney & Son, \$93,882; O'Sullivan & Sheehan, \$98,821; Patrick Waters, \$99,540, and Kelly & McMahon, \$112,574.

Cleveland, O.—Bids will be received Feb. 14 by the Bd. Pub. Service for constructing sewers in portions of 9 streets. A. R. Callow, Secy.

Wilkesbarre, Pa.—Bids will be received by Fred. H. Gates, City Clk., Feb. 24, to furnish and deliver sewer pipe and construct sewers on 47 streets, as advertised in The Engineering Record; probable cost of work, \$110,000.

Knoxville, Tenn.—See "Paving and Roadmaking."

Seattle, Wash.—See "Paving and Roadmak- ing."

Tacoma, Wash.—Press reports state that it is proposed to construct a trunk line sewer in the manufacturing district at the head of the bay by day labor, under direction of Public Works Comr. Welsh; it will cost bet. \$15,000 and \$18,000.

Toronto, Ont.—Press reports state that a new sewerage system will be recommended for the East End, to cost about \$80,000.

BRIDGES.

Notes Arranged Alphabetically by States.

Van Buren, Ark.—The Senate is stated to have passed a bill authorizing the construction of a bridge over Arkansas River.

San Jose, Cal.—Bids will be received by J. G. McMillan, Co. Surveyor, on Mar. 6, for a concrete rubble stone bridge over Los Gatos Creek.

Macon, Ga.—The construction of an arch or viaduct over the tracks of the Southern and Macon, Dublin & Savannah Ry., at Central City Park is reported under consideration.

Chicago, Ill.—The House of Represent- atives is stated to have passed a bill author- izing the Kensington & Eastern R. R. Co. to construct a bridge over Calumet River in Cook County.

Muskogee, Ind. Ter.—The construction of a street railway viaduct at Court St. is reported under consideration, at a probable cost of \$30,000.

Shreveport, La.—The House of Represent- atives is stated to have passed a bill author- izing the construction of a bridge over Red River here.

Boston, Mass.—See "Paving and Roadmak- ing."

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, es. Bronx Boro., for constructing sewer and appurtenances in W. 223d St. and on Bailey e; (a) W. J. Ford, 17 W. 103d St.; (b) Jas. Pilkington, Ft. Washington Park; (c) Briggs McLaughlin, 19 E. 130th St.; (d) Burns & Rodgers, 1909 Amsterdam Ave.:

	a.	b.	c.	d.
56 lin. ft. 4-ft. 9-in. brick sewer.....	\$20.00	\$20.00	\$27.00	\$23.00
103 " 4-ft. 6-in. " " " " " " " "	15.00	16.50	15.00	16.00
171 " 4-ft. " " " " " " " "	15.00	16.50	14.00	12.00
43 " 18-in. pipe sewer.....	6.00	5.00	4.00	6.00
120 " 15-in. " " " " " " " "	4.50	4.00	3.00	5.00
52 " 12-in. " " " " " " " "	4.00	3.50	3.00	4.00
270 spurs for house connections.....	1.00			1.00
29 manholes.....	50.00	70.00	65.00	80.00
525 cu. yd. rock excavated and removed	4.00	3.00	3.00	3.00
25 " concrete in place.....	4.00	5.00	3.00	...
25 " rubble masonry in mortar.....	4.00	5.00	3.00	...
1,000 " broken stone for foundations.....	3.00	1.50	1.00	...
50 M. ft. timber for foundations.....	40.00	25.00	...	...
500 lin. ft. piles below sills.....	.40	.01	...	...
50 " 12-in. drain pipe.....	1.00	...	...	...
Total.....	\$38,498	\$32,634	\$30,189	\$30,551

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, es. Bronx Boro., for constructing sewer and appurtenances in Boston Road, bet. Southern ular and E. 177th St.: (a) W. F. Murray, 1155 Boston Road; (b) Geo. I. Bailey, 168th t. and Fulton Ave.; (c) Bellev & Merritt Co., Tuckahoe, N. Y.; (d) W. J. Ford, 17 W. 103d ; (e) Briggs & McLaughlin, 19 E. 130th St.:

	a.	b.	c.	d.	e.
116 lin. ft. 18-in. pipe sewer.....	\$6.50	\$6.50	\$5.05	\$7.00	\$5.00
948 " 15-in. " " " " " " " "	5.50	5.00	4.00	6.00	5.00
184 " 12-in. " " " " " " " "	4.50	4.00	3.68	5.00	5.00
166 spurs for house connections.....	1.50		5.95	1.00	...
32 manholes.....	65.00	70.00	92.70	50.00	70.00
8 receiving basins.....	170.00	300.00	75.00	150.00	200.00
200 cu. yd. rock excavation and removal	3.50	3.00	3.30	4.00	5.00
8 M. ft. timber for foundation.....	40.00	10.00	40.00	30.00	...
Totals.....	\$34,945	\$30,237	\$31,196	\$36,636	\$36,080

Saginaw, Mich.—Bids are wanted Feb. 15 for constructing an iron bridge over Pine Creek in Chapin Township. J. W. Kerns, Co. Road Comr.

Battle Creek, Mich.—The City Council is stated to have decided to construct 2 cement arch bridges over the millrace, one at Jefferson Ave. and the other at Monroe St., at a probable cost of \$12,000.

Minneapolis, Minn.—The construction of a bridge at Washington Ave., S. E., is reported under consideration; probable cost, \$45,000.

Stillwater, Minn.—The City Council is reported to be considering the construction of a bridge over Lake St. Croix.

Madison, Neb.—Bids will be received Feb. 14 by the Bd. Co. Comrs. for constructing and repairing bridges and approaches during year 1905. Emil Winter, Co. Clk.

Kearney, Neb.—Bids are wanted Feb. 21 for furnishing material and constructing an 800-ft. bridge over South Channel of Platte River. A. V. Ofil, Co. Clk.

Brewster, N. Y.—See "Railroads."

Brooklyn, N. Y.—The following are the bids opened on Jan. 19 by Geo. E. Best, Comr. of Bridges, N. Y. City, for the con- struction of railway tracks and stairways and the reconstruction of expansion joints on the bridge over Newtown Creek, from Manhattan Ave. in Brooklyn Boro., to Vernon Ave. in Queens Boro.: Cooper & Evans, \$19,480 (awarded contract); Chas. Meads & Co., \$21,740; Snare & Triest Co., \$21,937; Jos. Gallo, \$23,000, and United Eng. & Contr. Co., \$23,435.

Celina, O.—Bids will be received Feb. 21 by the Bd. Co. Comrs. for furnishing material and constructing superstructure of steel bridge over Washburn River on Krenning Road, about 1 1/2 miles northeast of Macedon, in Washington Township, having one span 110 ft. long with 16-ft. roadway; also a steel bridge over said river on Grimmick Road, about 4 miles north of Ft. Recovery, on township line of Washington and Recovery Townships, having one span 105-ft. long with 16-ft. roadway. T. A. Wels, Co. Aud.

Portsmouth, O.—The construction of a viaduct over the railway tracks on 10th St. is reported under consideration. L. D. York is, according to reports, interested.

Jefferson, O.—The Bd. of Comrs. of Ash- tabula County is stated to have authorized the issue of \$200,000 bonds to provide for the construction of a bridge at Ashabula Harbor, to replace the one recently com- demned.

Scranton, Pa.—The Delaware, Lackawanna & Western R. R. Co. (L. Busch, Ch. Engr., Hoboken, N. J.) contemplates a renewal of its bridge across the Lackawanna River, but the work will probably not be done during the present year.

York, Pa.—The construction of a bridge over Susquehanna River at York Furnace is reported under consideration.

Alexandria, Va.—It is stated that the Washington Southern Ry. Co. and the citi- zens of Alexandria County will construct a steel viaduct, 640 ft. long, over the roadway from Poor House Lane to St. Asaph Junction.

Oshkosh, Wis.—The contract for building the superstructure of the proposed Main St. Bridge (bids opened Jan. 14 by the Bd. of Pub. Wks.) has been awarded to the Modern Steel Structural Co., of Waukesha, Wis., for \$58,673. For list of detailed bids received for this work, see issue of The Engineering Record Jan. 28.

Stevens Point, Wis.—It is stated that bids will be received until Feb. 7 by F. A. Krems, Compt., for constructing either an iron or steel bridge.

Dover, Ont.—It is stated that bids will be received until Feb. 23 by H. N. Bechard, Comr., Dover South, P. O., for constructing 2 steel or wooden bridges over Rivard Drain, Township of Dover, and for dredging about 3 1/2 miles of Rivard Drain. A. McDonnell, Engr., Chatham, Ont.

Manila, P. I.—The American Bridge Co., of New York, N. Y., is reported to have se- cured the contract for constructing the Ayala Bridge across Pasig River; probable cost of work is \$100,000.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

Hartford, Conn.—Bids will be received by the Connecticut River Bridge & Highway Dist. Comn., Feb. 27 for providing material and fill- ing and grading railroad tracks, streets and approaches, involving about 325,000 cu. yds., as advertised in The Engineering Record.

Savannah, Ga.—Bids are wanted Feb. 10 for furnishing the city with 100,000 hard burned sidewalk brick. Geo. M. Gadsden, Dir. Pub. Wks.

East St. Louis, Ill.—McCabe & Co., 411 Olive St., St. Louis, Mo., have secured the contract for paving Main St., from Bway to Missouri Ave. with Albion (Ill.) brick, for \$4,069.

Muncie, Ind.—The City Council is reported to be considering the paving of several streets with brick.

Indianapolis, Ind.—It is stated that the Bd. of Pub. Wks. will soon receive bids for paving with asphalt on a portion of 16th St., and for grading and graveling roadway of 11th St.

Jeffersonville, Ind.—The construction of a boulevard between Jeffersonville and New Al- bany is reported under consideration.

Des Moines, Ia.—Bids will be received Feb. 16 by the Bd. Pub. Wks. for curbing with Portland cement portions of Harrison Ave., E. 13th and W. 23d Sts., requiring about 9,008 lin. ft. curbing; bids will also be re- ceived on same date for paving with vitri- fied brick on 6-in. broken stone concrete foundation, with Portland cement top filler; in all about 4,354 sq. yd.

Ashland, Ky.—This city will during March let a contract for 60,000 sq. yds. brick paving on concrete base, and 5 1/2 miles of concrete curb and gutter. Chas. D. Boggess, City Engr.

Boston, Mass.—Pat'k. A. Collins, Chmn., Cambridge Bridge Comn., writes that John Harrington, of Cambridge, has secured the contract for furnishing curb for the new Cam- bridge Bridge, about 7,000 lin. ft. for \$20,312 (bids opened Jan. 24). The Pigeon Hill Granite Co., of Rockport, Mass., secured the contract for supplying 325,000 paving block at \$51 per M.

Flint, Mich.—D. E. Newcombe, City Clk., writes that bids are wanted Feb. 20 for a road roller, to cost about \$2,000 or \$3,000; also for 3 hauling cars to be used in connection therewith. Bids to be received separately on the roller and the cars.

Kalamazoo, Mich.—Bids are wanted Feb. 13 for about 49,000 sq. yd. street paving and 24,000 lin. ft. cement combined curb and gutter. M. C. Taft, City Engr.

Meridian, Miss.—See "Sewerage and Sewage Disposal."

St. Louis, Mo.—The Bd. of Pub. Improve- ments is stated to have awarded on Jan. 27 contracts for paving portions of the follow- ing streets: Burd Ave., Barber Asphalt Pav- ing Co., Holland Bldg., \$19,271; Moffitt Ave., Michael Hanick, \$15,122; Farragut St., Jas. T. McMahon, \$7,171; Lucky St., Herman Constr. Co., 108 1/2 N. 8th St., \$11,200; Flor- issant Ave., Granite Bituminous Paving Co., \$25,590; Wisconsin and Vermont Aves., Poto- mac and Papin Sts., Gottlieb Byerman, \$34,100; Conde St. and John Ave., Skrainka Constr. Co., 319 N. 4th St., \$17,149; Green Lea Pl., Virginia, Evans and Barmter Aves., Parker Washington Co., \$61,608. Bids will be received Feb. 14, by the Bd.

Pub. Improv., for improving by grading, pre- paring roadbed or ground for superstructure, constructing granite curb and paving with vitrified brick and concrete base, portions of 7 streets and requiring a 6-year mainten- ance guarantee; also for constructing side- walks, including grading, preparing ground for superstructure, placing foundation of cin- ders and constructing a granite pavement on portions of numerous streets. Waller Ed- wards, Secy.

Atlantic City, N. J.—J. W. Hackney, City Engr., writes that all bids opened on Jan. 16 for paving Atlantic Ave. have been re- jected, and no arrangements have as yet been made to receive new bids. According to press reports C. A. Snow, of Boston, Mass., has been appointed to assist City Engineer Hack- ney in the preparation of nek specifications for the paving of Atlantic Ave.

Jersey City, N. J.—Geo. T. Bouton, Clk. St. and Water Bd., writes that the contract for paving with Belgian on a portion of Logan Ave. (bids opened Jan. 10) has been awarded to J. & R. Shannon Co., 533 Bergen Ave., at 88.97 per cent. of 100 per cent. of standard price.

Bids will be received Feb. 6, by the Bd. Streets and Water Comrs., for improving por- tions of Orient and Plainfield Aves.; estimate of quantities, 2,308 cu. yds. earth excavation, 342 cu. yds. earth fill, 3,350 sq. yds. asphalt, 3,153 lin. ft. curb stone, 10,050 sq. ft. bridge stone patent sidewalks, etc. Geo. T. Bouton, Clk.

Windsor, N. J.—Bids will be received Feb. 14 by Jed Dubois, Boro. Clk., for construct- ing or relaying cement curb and sidewalks in said Boro., requiring approximately 125,000 sq. ft. walk and 25,000 lin. ft. curb.

Jersey City, N. J.—The Uvalde Asphalt Co., 1 Bway, New York City, and John No- lan, 171 Bright St., are stated to have re- ceived the contracts for improving Carlton and Mallory Aves. respectively; about 2,935 cu. yd. excavation, 3,072 sq. yd. asphalt, 370 sq. yd. Belgian paving, 2,283 lin. ft. curb- stone and 4,458 sq. ft. flagging, etc., are quantities required (bids opened by Bd. Street and Water Comrs. on Jan. 23).

Pleasantville, N. J.—Bids will be received Feb. 8 by John B. Hess, 710 Land Title Bldg., Philadelphia, Pa., for loading, delivering, spreading and rolling 25,000 cu. yds. gravel for boulevard over meadows from Pleasant- ville to Chelsea Heights. For specifications apply to H. E. Kaufman, Hotel Rodney.

Brooklyn, N. Y.—The following are the bids opened on Feb. 1 by Martin W. Littleton, Pres. Brooklyn Boro., for regulating and pav- ing with asphalt concrete foundation: Bristol St. (a) 7,870 sq. yds. asphalt; (b) 1,090 cu. yds. concrete; (c) total: E. Ber- mudez Asphalt Paving Co., a, \$1.40; b, \$5.70; c, \$17,231. Cranford Co., a, \$1.25; b, \$5.50; c, \$15,832. Interstate Paving Co., a, \$1.45; b, \$2; c, \$13,591. B. Alcalraz Co., a, \$1; b, \$5; c, \$13,320. Uvalde Paving Co., a, 98 cts.; b, \$5; c, \$13,162. (Awarded con- tract.)

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, Pres. Bronx Boro., for paving with asphalt blocks Crotona Ave., from Crotona Park north to 187th St.; (a) Hastings concrete foundation, Quinlan Asphalt Co.; (c) Harlem Contr. Co.; (d) Asphalt Contr. Co.; (e) Barber As- phalt Paving Co.:

	a.	b.	c.	d.	e.
23,250 sq. yd. cu. yd. asphalt.....	3,600	1,500	8,350		
asp. con- crete.....					
blocks.....					
a.....	\$1.45	\$5.20	\$0.60	\$0.25	\$55,420
b.....	1.50	5.28	.90	.32	57,988
c.....	1.50	5.20	.90	.32	57,980
d.....	1.60	5.00	.92	.30	59,085
e.....	1.64	3.94	.44	.25	55,145

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, Pres. Bronx Boro., for regulating, etc., 19th St., from Crotona Ave. to Anthony Ave.; Jos. Gallo, \$9,195; G. I. Bailey, \$10,263; Pat. Hannan

New York, N. Y.—The following are the bids opened on Jan. 24 by Louis F. Haffen, Pres. Bronx Boro., for regulating, etc.: (a) D. W. Moran, (b) C. A. Meyers, (c) C. F. McCabe, (d) W. F. Murray, (e) P. Handbode, Jr., (f) Bellevue & Merritt Co., (g) Patrick Hannan, (h) T. Brogan, (i) P. V. Smith Contr. Co., (j) P. J. Duffy, (k) G. I. Bailey, (l) Jos. Gallo, (m) Vermilye-Garry Contr. Co., (n) Patrick Goodman:

Quarry Road, from Third Ave. to Arthur Ave.

Excavation	4,100	9,700	3,800	1,600	6,150	1,750	50 yd.	50 lin. ft.	Totals
cu. yd.	cu. yd.	cu. yd.	cu. yd.	sq. ft.	sq. ft.	sq. ft.	dry	12-in.	
earth.	rock.	fill.	curb.	flag.	stone.	stone.	rubble	vitified	
a.		\$1.90	\$0.60	\$0.75	\$0.28	\$0.55	\$0.70	\$0.70	\$24,543
b.		1.70	1.15	1.15	1.15	1.15	1.15	1.15	23,095
c.		1.40	1.10	1.10	1.10	1.10	1.10	1.10	18,797
d.		1.35	1.09	1.09	1.09	1.09	1.09	1.09	18,749
e.		1.10	1.10	1.10	1.10	1.10	1.10	1.10	19,741
f.		1.09	1.09	1.09	1.09	1.09	1.09	1.09	18,591
g.		1.50	1.15	1.15	1.15	1.15	1.15	1.15	20,342
h.		1.70	1.10	1.10	1.10	1.10	1.10	1.10	22,958
i.		1.40	1.10	1.10	1.10	1.10	1.10	1.10	18,677
j.		1.65	1.10	1.10	1.10	1.10	1.10	1.10	22,855
k.		1.75	1.15	1.15	1.15	1.15	1.15	1.15	24,727
l.		1.58	1.10	1.10	1.10	1.10	1.10	1.10	20,627

Bryant Ave., from Boston Road to E. 182d St.

Excavation	h.	f.	k.	j.	m.	k.	a.	d.	n.
1,800 yd. earth ..	\$0.01	\$0.35	\$0.30	\$0.45	\$0.40	\$0.64	\$0.40	\$0.99	\$0.30
11,900 " rock ..	1.70	1.60	1.58	1.98	2.00	1.67	1.75	1.95	1.50
10,400 yd. fill ..	.38	.02	.10	.01	.00 1/2	..	.20	.35	.80
3,550 ft. curb ..	.85	.87	.70	.74	.70	..	.70	.99	.80
15,000 " flag ..	.23	.27	.23	.24	.24	.20	.24	.20	.27
650 yd. masonry	1.05	2.00	2.00	1.98	2.00	2.00	.80	1.90	2.00
Total	\$31,350	\$28,316	\$27,617	\$31,990	\$32,312	\$27,810	\$30,336	\$36,376	\$29,700

New York, N. Y.—The Bd. of Estimate is stated to have appropriated money for paving to be used in the different boroughs as follows: \$900,000 for Manhattan, \$900,000 for Brooklyn, and \$300,000 for each of the boroughs of Bronx, Richmond and Queens.

Cleveland, O.—The following are the bids opened on Jan. 25 by the Bd. of Public Service for paving with 5-in. brick the following streets: (a) Lyman St., (b) Wooldridge Ave., (c) Glass Ave., (d) Trumbull St., (e) E. Chestnut St., (f) Douglass St., (g) Aaron St., (h) Clifton St. (bidders all of Cleveland): Northern Ohio Paving Co., \$18,938; b, \$6,171; c, \$6,952; d, \$11,816; e, \$13,046; f, \$8,679; g, \$11,006; h, \$14,593; J. F. Brennan, \$19,379; i, \$8,874; j, \$10,920; k, \$14,472; Cleveland Trinidad Paving Co., \$19,322; l, \$6,248; c, \$6,062; d, \$12,370; e, \$13,482; f, \$9,154; g, \$11,378; h, \$15,081; Standard Paving Co., \$19,133; i, \$6,018; j, \$5,820; k, \$11,632; l, \$12,973; b, \$8,858; g, \$10,968; h, \$14,571; Baldwin Bros. & Graham, \$19,579; b, \$6,218; c, \$5,987; d, \$11,996; e, \$13,291; f, \$9,026; g, \$11,246; h, \$14,917; Roehl Bros., \$19,080; b, \$6,017; c, \$5,920; d, \$11,748; e, \$12,845; f, \$8,884; g, \$11,045; h, \$14,578.

***Cincinnati, O.**—E. S. Gleason, 1906 Highland Ave., has secured the contract for macadamizing a portion of Carthage Pike (bids opened Jan. 25) for \$1,856.

Bids will be received Feb. 8 by the Bd. Pub. Service for furnishing material and improving a portion of Marmet St. by grading, setting granite curb and paving the roadway with granite and constructing necessary drains and retaining walls. Geo. F. Holmes, Clk.

Bids will be received until Feb. 24 by the Bd. Pub. Service for furnishing material and improving a portion of Marmet St. by grading, setting granite curb and paving the roadway with granite and constructing necessary drains and retaining walls. Geo. F. Holmes, Clk.

Canton, O.—It is proposed to pave with vitrified paving block Walnut St.; roadway, 40 ft.; estimated cost, \$17,900. Chas. Zellars, Clk. Bd. Pub. Service.

Toledo, O.—Bids will probably be called for about Feb. 15 for paving streets as follows: Jefferson St. with asphalt or creosoted block or brick, at a cost of \$35,000 to \$40,000; Idaho St. probably with brick, at a cost of \$12,000, and Water St. probably with brick or Medina block stone, at a cost of \$20,000. F. I. Consaul, City Engr.

Perrysburg, O.—Bids are wanted March 1 for \$5,294 bonds to be used for grading, draining, curbing and macadamizing a portion of Front St. T. M. Franey, Village Clk.

Toledo, O.—Bids will be received Feb. 15 by the Bd. Pub. Service for furnishing material and paving with either various kinds of block, bitulithic pavement or other bituminous macadam on portions of Collingwood Ave., Warren and Monroe Sts.

Celina, O.—Bids will be received until Feb. 25 by the City Bd. for ditching, grubbing, grading, graveling or macadamizing and constructing necessary bridges and culverts for the Gottfried Linn Road Improv. The total length of the road is about 13,293 ft. M. Lutz, Co. Engr.

Dayton, O.—Bids will be received Feb. 10 by the Bd. Pub. Service for paving with brick, bituminous macadam, sheet or block asphalt, a portion of Curtis Ave., requiring approximately 1,760 lin. ft. straight, 120 lin. ft. circular and 109 lin. ft. protection curbing, and 3,350 sq. yds. paving; bids will also be received on same date for paving with brick or bituminous macadam a portion of 5th St., requiring approximately 1,850 lin. ft. straight, 109 lin. ft. circular and 250 lin. ft. protection curbing, and 3,850 sq. yds. paving. Wm. F. Miller, Clk.

Ingram, Pa.—Bids are wanted Feb. 7 for grading, curbing and paving a portion of Linden Ave. Approximate quantities: 3,500 cu. yd. grading, 2,956 ft. dressed stone curbing, 180 ft. rough stone curbing, and 5,100 sq. yd. brick block paving. John McBride, Boro. Engr., Rm. 46, Fidelity Bldg., Pittsburgh.

Meadville, Pa.—Bids will probably be received about Feb. 15 for paving Park St. with brick or asphalt; the estimated cost of the work, including storm sewers, is \$27,000. W. A. Doane, City Engr.

York, Pa.—Bids will be received Feb. 24 by the State Highway Dept., of Pa., at Harrisburg, for constructing 7,085-ft. road in Spring Garden Township.

Harrisburg, Pa.—The United Ice & Coal Co., of Harrisburg, is stated to have submitted the lowest bid Jan. 18 for constructing about 7,700 ft. of the Harrisburg, Ephrata and Downingtown turnpike in Swarta Township, their bid being \$7,457 for a Paxtang limestone road.

Wilkesbarre, Pa.—Bids will be received by Fred. H. Gates, City Clk., on Feb. 27 for the removal of 7 miles of cobblestone pavement and to curb and repave said streets with vitrified fire clay paving brick, as advertised in The Engineering Record; probable cost of work from \$110,000 to \$140,000.

Chattanooga, Tenn.—It is stated that the Bd. of Pub. Wks. has decided to pave a portion of E. 9th St. with granite blocks and slag.

Knoxville, Tenn.—The issuing of about \$125,000 bonds for improving streets and sewers is reported under consideration.

Seattle, Wash.—An ordinance has been passed by City Council providing for the improvement of 3d Ave. and other connecting streets by grading and regrading. No estimate of the cost yet prepared, but the district to be improved embraces about 4 1/2 miles. It is on the outskirts of the main business streets, and between the residence portions of Seattle.

The City Council is stated to have passed ordinances and resolutions on Jan. 16, the estimated cost of which is reported to amount to \$1,500,000, and the work includes the regrading of 3d and 4th Aves. and cross streets, about \$600,000 worth of asphalt paving on Renton Hill, Queen Anne Hill, Denny Way, 1st Ave. and Cedar St.; water mains and improvements to sections of other streets throughout the city and the construction of a sewer in Latona Ave.

Fond du Lac, Wis.—It is stated that Division, Sheboygan and 2d Sts. will be paved; estimated cost of asphalt, \$30,000, and \$18,000 for macadam.

Winnipeg, Man.—Bids will be received by the Chairman, Com. on Works, Feb. 21, for 1,000 to 1,500 tons asphalt for street paving, as advertised in The Engineering Record.

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Uniontown, Ala.—W. J. Valden, Mayor, writes that it is proposed to construct water works and an electric light plant to cost about \$4,000. The matter will probably be taken up in April. Engineer, S. T. Townsend.

Sturdevant, Ala.—The Tallapoosa Water Power & Electric Co. is about to file papers of incorporation. The company proposes harnessing Tallapoosa River at Sturdevant and developing 8,000 h.p. Incorporators: Mr. A. Buford of Montgomery, and Mrs. Parker, of Goodwater.

San Francisco, Cal.—The California Gas & Electric Corporation (John A. Britton, Gen. Mgr., San Francisco) is stated to have purchased the plants of the South Yuba Water Co. and the Central California Electric Co.

Oakland, Cal.—Press reports state that an ordinance is about to be introduced in City Council looking toward the placing of all wires underground in the business district, within 3 yrs.

Rifle, Colo.—A. L. Hackenberger, of Dallas, Tex., is reported to have decided to construct an electric light plant at a probable cost of \$25,000.

Rome, Ga.—The City Council will petition the State Legislature for permission to construct and operate a municipal electric light plant.

Cairo, Ga.—The clerk of Council writes that the citizens voted Jan. 25 in favor of issuing \$15,000 bonds for the construction of water works and an electric light plant.

Muncie, Ind.—Wm. F. Warner has petitioned City Council for a franchise to construct, maintain and operate an electric light plant in Muncie.

Logansport, Ind.—Jas. Murdock, of Lafayette, and the other proprietors of the Logansport & Wabash Valley Gas Co. are reported to have decided to substitute artificial fuel gas for the natural product, and will soon begin the construction of the plant.

***Indianapolis, Ind.**—John E. Clelland, Bus. Dir. Bd. Educ., writes that the contract for installing electric light and gas fixtures in Shortridge High School (bids opened Jan. 23) has been awarded to Sanborn-Martin Electric Co., of Indianapolis, for \$1,143.

Cedar Falls, Ia.—The Waterloo & Cedar Falls Gas & Electric Co. will install a gas plant in Cedar Falls this season and lay out 7 miles of mains. Austin Burt, Local Mgr., Waterloo.

Coffeyville, Kan.—The following are the bids opened on Jan. 18 for the construction of an electric light plant, to consist of two 143-hp simple Corlies engines, 2 72 in. x 18 ft. tubular boilers, 300-h.p. feed-water heater, piping, valves, and fittings; 225 kw. generators excitors, switchboard, arc lighting apparatus, station wiring, belts, installing power equipment, and foundations (Engineer, W. K. Palmer, Kansas City, Mo.): English Iron Wks., Kansas City, Mo., bid for engines, \$3,854; boilers, \$2,217; feed-water heater, \$270, and belts, \$235 per ft. Hodge Walsh Electric Co., Kansas City, Mo., bid for generators excitors, \$20-kw., \$3,857, and 140-kw., \$4,304; switchboard, \$555, and arc lighting apparatus, \$691. W. T. Osborn & Co., Kansas City, Mo., bid for generators excitors and switchboard, \$5,078. Murray Iron Wks., Chicago, Ill., engines, \$5,000, and boilers, \$2,800. Geo. W. Webb & Co., Kansas City, Mo., bid for belts, \$1.95 per ft. Chadburne & Biedsoe, Kansas City, Kan., submitted 3 bids, in total ranging from \$14,781 to \$15,336.

Great Western Mfg. Co., Kansas City, Mo., bid for engines \$4,306; boilers, \$2,859; heater, \$385, and belts, \$475. National Electric Co., St. Louis, Mo., bid for generators excitors, \$3,733, and switchboards, \$1,100. The Ft. Wayne Electric Co., St. Louis, Mo., submitted a bid of \$6,175, and E. M. Reed, Kansas City, Mo., bid for generators excitors, \$4,912, and switchboards, \$1,000.

Waterville, Me.—A petition is reported to have been presented to Legislature to incorporate the Messalonskee Electric Co., by Harvey D. Eaton, Walter S. Wyman, John N. Webber and others, of Waterville. The purpose of the corporation is to generate, sell, distribute and supply electricity in Waterville, Oakland, Fairfield, Benton and Winslow; capital, \$250,000.

Houlton, Me.—The Houlton Electric Light & Power Co. is reported organized, for the purpose of generating and supplying electricity for heating and lighting; capital, \$10,000. Houlton T. Friblee and Walter F. Mansur, of Houlton, are the incorporators.

Bangor, Me.—Press reports state that the Maine & New Brunswick Electric Power Co. will in the early spring begin the development of its property at Aroostook Falls, and before the end of the year proposes to have in operation a plant to supply electric light and power to a number of towns in Maine and New Brunswick. Arthur R. Gould, of Presque Isle, Me., is reported interested.

Chestertown, Md.—D. S. Pindell, of Saulte Ste Marie, Mich., engineer and promoter of the electric light plant to be constructed at Chestertown, writes that the proposed plant will cost \$30,000.

Dalton, Mass.—Press reports state that Z. & W. M. Crane have contracted with the Pelton Water Wheel Co., of New York, N. Y., and the Stanley Electric Mfg. Co., of Pittsburgh, for electric apparatus for a water power plant to be installed at the stone mill in the Renfrew District, to supply electricity to the Dalton Mills and other industries; it will cost about \$75,000.

Fairhaven, Mass.—The question of constructing a gas plant is under consideration here. Norman M. Paul, P. O. Box 402, Fairhaven, would be glad to receive pamphlets, etc., on the various gas-manufacturing systems.

Ludington, Mich.—H. M. Wallace, 319 Houseman Bldg., Grand Rapids, writes that Warren & Pettigrew, of Fox Lake, Wis., will probably construct the gas plant at Ludington; 9 miles of mains will be required.

Menominee, Mich.—The plant of the Menominee Electric Mfg. Co. is reported to have been destroyed by fire on Jan. 23.

***Marquette, Mich.**—The Westinghouse Co., Pittsburgh, Pa., is reported to have secured the contract for 125 alternating current street lamps, two 75 lamp converters, switchboard panel and other equipment necessary to change the open arc system to the alternating current lamp system, for \$3,300.

International Falls, Minn.—Penniman & McGuire, of Providence, R. I., are stated to have secured the contract for constructing a dam at Koochiching Falls, for the Backus-Brooks Co., of Minneapolis; probable cost of work, \$500,000.

Norris, Mont.—Thos. A. Ferguson writes that work will begin as soon as weather will permit on the construction of a power plant.

Sedalia, Mo.—Jos. McWilliams & Co., of Louisville, Ky., are stated to have been selected by the Sedalia Water, Gas & Electric Co. to prepare plans and specifications for a new central power station and to erect same complete, together with all machinery and apparatus to operate the street railway and water-works and furnish current for the city and commercial lighting; cost of plant will be about \$145,000.

St. Louis, Mo.—Bids will be received Feb. 14, by the Bd. Pub. Improv., for furnishing, cleaning, repairing, maintaining and operating all lamps with refractory mantles made incandescent by combination of a vacuum and a gas, to give an illuminating power equal to 60 standard candles each; for lighting streets, avenues, alleys, wharves, public grounds and squares in southern portion of said city; approximate number of mantle lamps required is 1,662. Waller Edwards, Secy.

Trouton, N. J.—Bids will be received Feb. 7 by the Common Council, for furnishing material and lighting, extinguishing and maintaining gas, Weisbach and naphtha Weisbach lights on streets and public places of city for a period of 1, 2 or 3 yrs. Harry B. Salter, City Clk.

Highlands, N. J.—The question of constructing water-works and an electric light plant has been reported as being discussed. N. Cornwall, Mayor.

Canastota, N. Y.—The business men of the village are reported to be in favor of constructing a municipal electric light and power plant, and a committee has been appointed with E. S. Sisman as chairman, to obtain specification and plans, and estimates for the required plant.

Palmyra, N. Y.—The Palmyra Gas & Electric Co. has been incorporated, with a capital of \$2,500, to manufacture gas and electricity and supply light, heat and power. Directors: Wm. T. Morris and Geo. H. Shepard, Palmyra; Chas. McLouth, Palmyra, and others.

Rochester, N. Y.—The Eastern Monroe Electric Light & Gas Co. has been incorporated, with a capital of \$250,000, to furnish light, heat and power in Rochester, Brighton and Irondequoit. Directors: Henry C. Brewster, Rochester; Andrew H. Bown and Clarence Shuster, both of Penfield, and Walter Parce, Fairport.

Plattsburgh Barracks, N. Y.—Capt. T. Lamoreaux, Q. M., U. S. A., Burlington, Vt., writes that the lowest bid opened on Jan. 18 for furnishing and installing electric light fixtures in two double sets, officers' quarters and storehouse here, was submitted by the Northern Electric Co. of Burlington, Vt.

New York, N. Y.—Bids will be received Feb. 14 by the Dept. Pub. Charities for furnishing material for electric installation Metropolitan Hospital, Blackwell's Island. Jas. H. Tully, Comr.

Bids will be received Feb. 14 by C. B. Snyder, Supt. School Bldgs., for installing electric equipment in School No. 7, Bronx.

Buffalo, N. Y.—The Iroquois Electric Co. of Buffalo, has been incorporated, with a capital of \$1,000,000, to manufacture electricity for light, heat and power in North Tonawanda, Buffalo, Tonawanda and villages and towns in Erie and Niagara Counties. Directors: Geo. Francis V. Greene, Edmund Hay Wm. H. Hotchkiss and others, all of Buffalo.

New York, N. Y.—See "Street Cleaning and Garbage Disposal."

Syracuse, N. Y.—Local press reports state that if the Syracuse Lighting Co. procures renewal of its contract for city lighting about \$100,000 will be expended for improvements. John J. Cummins, Pres.

Camden, N. Y.—Press reports state that this village has appropriated \$40,000 for the construction of a municipal electric light plant.

Rome, N. Y.—The Rome Electrical Co. reported incorporated, with a capital of \$40,000, by N. H. Jones, G. A. Clyde and others of Rome.

Toledo, O.—The contract for lighting streets for a period of 2 or 5 yrs. (bids opened Jan. 25) has been awarded to Toledo Ry. & Light Co., of Toledo, at \$83 arc light per yr.

Canton, O.—The Sandy Valley Light, Heat & Power Co., Canton, is reported incorporated with a capital of \$25,000 by Wm. L. Da Grant B. Wells and others.

Wanette, Okla. Ter.—Philip Hall, of Shiloh, is reported interested in the construction of water works and electric light plant at Wanette.

***Enola, Pa.**—J. N. Bastress & Co., of Enola, are stated to have secured the contract to erect a power plant at Enola for Pennsylvania R. R. Co. The building will be of brick, 66x66 ft., and will supply electric and compressed air to the new railroad yard.

Columbia, Pa.—John S. Graybill, Jr., Lancaster, is reported to be one of the incorporators of the Columbia Electric Light & Power Co., which has a capital of \$10,000.

Calhoun Falls, S. C.—Dr. S. M. Orr, of Anderson, S. C., and O. H. Sheffield, of Atlanta, Ga., are interested in developing the Savannah River power above Calhoun Falls, including Cheke and Gregg Shoals. Jos. E. Shirrine, Greenville, is stated to have prepared plans. The dam will be 1,000 ft. long, 24 ft. high, and will develop 6,600 h.p.

Memphis, Tenn.—Two applications for franchises to build and operate lighting plants and furnish light for municipal purposes have been presented to Council; one from the Merchants' Power Co., and the other from Memphis General Electric Co.

Johnson City, Tenn.—The Bd. of Mayor Aldermen have decided to petition the Legislature for permission to vote and issue \$200,000 bonds for the construction of water works or the purchase of the local system, and \$500 for the building of an electric light plant.

Lufkin, Tex.—The Lufkin Electric Light & Power Co., of Lufkin, is reported incorporated, with a capital of \$30,000. Incorporators: S. W. Henderson, G. A. Hackney, and Henderson.

Ft. Worth, Tex.—F. W. Potter is stated to have petitioned City Council for an electric light and power franchise.

La Crosse, Wis.—The City Council is reported to have granted a franchise to theconsin Light & Power Co., to operate in La Crosse.

*Items marked thus give the names of parties awarded contracts.

Mexico City, Mex.—The Mexican-American Ry. Co. is reported incorporated, with a capital of \$150,000, by Joel H. DeVictor, G. Hart Simons, and B. Harvey Welch, for manufacturing and selling electric light and power in Mexico. Registered office of the company, 417 Market St., Camden, N. J., the Jersey Corporation Guarantee and Trust being the agent.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Eureka, Cal.—J. E. Green and associates are applied for a franchise to construct and maintain an electric railway upon certain portions of county road; and bids for said franchise will be received Feb. 15, by W. H. Haw, Bd. Supervs.

East St. Louis, Ill.—The East St. Louis, Waterloo & Chester Suburban Ry. Co. has been organized to construct a line from East St. Louis to Waterloo and Chester, passing through the counties of Stair, Monroe and Randolph. Incorporators: Tyrone J. Wood, Jr. of St. Louis, Mo.; Jas. P. Slade and B. Garsett, of East St. Louis, Ill., and others.

St. Louis, Freeburg & Fayetteville R. R. has been incorporated, with the principal office in East St. Louis; capital stock, \$10,000. A new company will construct a line from Belleville to Fayetteville. Incorporators: E. E. Amb, of O'Fallon, Ill.; Geo. Geisler and A. Vogler, of St. Louis, Mo., and others.

Mason City, Ill.—The Central Illinois Interurban R. R. Co. has been incorporated to construct an interurban line from Peoria to Clinton, Mason City, Springfield, Havana and Mendon. John B. Abbott, Paul A. Enlow, and H. Hindach and others, all of Mason City, are the incorporators.

Edwardsville, Ill.—The contract for constructing 80 miles of electric railway out of Edwardsville is stated to have been awarded to the J. H. McInerney Constr. Co., of Grand Forks, N. D.

Terre Haute, Ind.—The plant of the Terre Haute Traction & Light Co. is reported to have been damaged by fire to the extent of over \$50,000.

Louisville, Ky.—H. W. Richardson, Keller Idg., Louisville, Ky., is reported interested in the construction of a railway from Evansville, Ind., to Henderson, Ky., 12 miles, and Henderson, Ky., to Owensboro, Ky., 25 miles.

Baltimore, Md.—John Waters, 23 E. Centre St., is stated to have secured the contract for the construction of the northern portion of the Pratt St. power house of the United Rys. & Electric Co.; the entire cost of building and installing new machinery will be about \$250,000.

Boston, Mass.—Bids will be received by the Boston Transit Comm. (B. Leighton Beal, Secy.) on Feb. 14, for constructing Sect. 4 of the Washington St. tunnel, as advertised in The Engineering Record.

L. F. Shoemaker & Co., of Philadelphia, Pa., have secured the contract for about 440 tons of structural steel for Sec. 4 of the Washington St. tunnel, bids opened by the Boston Transit Comm., Jan. 28, at \$47.90 per ton.

Belleville, Mich.—The Council of Belleville has received an application for a franchise for an electric railway from the Michigan Central R. R., and it is reported his company will build an electric railway from Detroit to Jackson.

St. Paul, Minn.—An ordinance granting a 50-year franchise to the Minneapolis, St. Paul & Suburban Ry. has been introduced in the City Council of South St. Paul.

Yazoo City, Miss.—Bids will be received by E. J. Poursine, City Clk., for franchise for an electric street railway.

Sedalia, Mo.—See "Power Plants, Gas and Electricity."

Missoula, Mont.—A franchise for the construction of an electric street railway system here has been petitioned for by representatives of W. A. Clark, of Butte, Mont.

Weehawken, N. J.—The New York & North New Jersey Rapid Transit Co. has filed its charter at Trenton, and proposes to run electric trains from Weehawken to Paterson; capital, \$200,000. Length of proposed line, 13.6 miles. It is proposed to tunnel through the Palisades and run the line on an elevated track part of the way. Incorporators: John W. Griggs, M. R. McAduo and others of New York, N. Y.

Utica, N. Y.—It is believed that the Utica & Mohawk Valley Ry. Co. will secure permission to build a double track through the villages of Ilion and Mohawk.

Toledo, O.—The Ottawa Park St. Ry. Co. has been incorporated, with \$10,000 capital, by J. F. Kumler, L. W. Kumler and others, to build a line from Bancroft and Monroe Sts. to Ottawa Park. The company has obtained franchises from the city and from the County Comrs.

Barton, O.—The Westinghouse Co. is reported to be preparing estimates on the electrical equipment for a line from Barton to Uhrichsville, Ohio. Edw. Hobson, of Flushing, Ohio, is the chief promoter.

Barberton, O.—The Wadsworth & Western Traction Co. has been incorporated by B. W. Clendenning, G. H. Heffner, Wm. A. Ault and others, to build first from Barberton to Wadsworth to give the latter place connection for Cleveland, and it is also stated that the road may be extended to Akron and Seville, where connection will be made with the Cleveland & Southwestern.

Cleveland, O.—A new ordinance has been introduced in the Council granting a franchise to the Cleveland Electric Ry. Co., for a crosstown line on Woodland Hills Ave.

Guthrie, Okla. Ter.—The Guthrie Ry. Co., with offices at Guthrie and Pittsburg, Pa., was chartered Jan. 14 to build an electric railway from Edmond, Okla. Ter. to Guthrie. The length of the railroad is 20 miles, and its estimated cost \$600,000; capital, \$300,000. Directors, Geo. H. Brainer and W. J. Faulkner, of Oklahoma City, and J. A. Cottingham, G. M. Green and L. N. Bradley, of Guthrie.

Portland, Ore.—A franchise has recently been granted for the construction of an electric railway from Forest Grove to the city limits of Portland, Ore., a distance of about 26 miles, and the Atlas Constr. & Supply Company of San Francisco, is expecting the franchise to commence construction work on the line in February. Power to operate the line will be rented from the General Electric Co., of Portland.

Shenango, Pa.—The Sharpville Council has passed the Shenango Traction Company's franchise for a line through the borough. Engineer, W. A. Waugh, of Greenville. Franchises are now being considered by the Councils of Sharon, South Sharon, Wheatland and West Middlesex.

Luling, Tex.—A. N. Fisher, of Boston, Mass., is agent for Boston and St. Louis capitalists who are behind the movement for an electric railway between Luling and San Marcos.

Richmond, Va.—The Richmond & Chesapeake Ry. Co. will probably shortly be incorporated. This is the company in which Frank Gould, of New York, is interested and which purposes to build a railroad line, to be operated by either steam or electricity, from Richmond to Ashland, and thence to Chesapeake Bay.

Spokane, Wash.—The plan of the Spokane Interurban Co. to construct, at an estimated cost of \$3,225,000, an electric road from this city through Palouse County to Moscow, Ida., is receiving hearty encouragement from local merchants and manufacturers.

RAILROADS.

Notes Arranged Alphabetically by States.

Leslie, Ark.—S. W. Lee, of Eureka Springs, Ch. Engr., St. Louis & North Arkansas R. R. Co., is reported to be arranging to put a corps of surveyors in the field below Leslie, in connection with the extension of its line south-east.

San Francisco, Cal.—Press reports state that the actual construction work of the Western Pacific R. R. will begin within 2 months. Rights of way and a San Francisco terminal are said to have been finally secured, and the necessary money is available.

San Francisco, Cal.—The Bay Shore cut-off of the Southern Pacific Ry., now being built to eliminate excessive grades and curvature between this city and San Bruno, about 12 miles distant, is now well under way. A 3-mile contract on the south end, awarded to Erickson & Peterson, of this city, consists of heavy rock cutting, probable tunneling and bay filling, amounting to 1,000,000 yd. They have at present 2 steam shovels and 3 engines with accessories at work on the undertaking and expect to augment this plant considerably in the near future. W. Hood, Ch. Engr., San Francisco.

Tallahassee, Fla.—The Western Ry. of Alabama is stated to have decided to build a railroad 40 miles in length, running into Coosa and Elmore Counties in the southern portion of the State. The new road is to be built either from Millstead or Tallahassee. Chas. A. Wickersham, of Atlanta, Ga., Pres. and Gen. Mgr.

Indianapolis, Ind.—The City Council has passed an ordinance appropriating \$25,000, and entering into a contract with the railroad companies to elevate the tracks at Massachusetts Ave.

Sioux City, Ia.—The Iowa & Great Northern Ry. Co., of Sioux City, is reported incorporated, with a capital of \$500,000, by L. W. Hill, R. I. Farrington, and others, to build terminals and railroads within the State of Iowa.

Topeka, Kan.—At a special meeting of the stockholders of the Atchison, Topeka & Santa Fe Ry. Co., Jan. 24, an increase in the capital stock of the company of \$50,000,000, bringing the total capital to \$23,485,000, was approved. According to press reports, there will be about 155 miles of second track built, including the completing of the double track of the system between Chicago and Streator, Ill., and new second track east and west of Marceline, Iowa. The track between Holliday and Emporia, Kan., on the cut-off will be double tracked. The 7-mile freight yard in Argentine, Kan., will be completed, and a 1,500,000-bushel elevator built in Argentine, to cost \$400,000. The cut-off between Texico, on the Pecos Valley line, and the main line, west of Albuquerque, will be completed. Jas. Dun, Ch. Engr., Chicago, Ill.

Minneapolis, Minn.—The Chicago, Milwaukee & St. Paul Ry. Co. (D. J. Whittemore, Ch. Engr., Chicago, Ill.) is reported to be considering the separation of grade crossings at Washington Ave. s. e.; also at Cedar and Franklin Aves.

Kansas City, Mo.—M. J. Smith, of South McAlester, Ind. Ter., Ch. Engr. Kansas City, Oklahoma & Houston R. R. Co., writes that contracts for the construction of this line have not yet been let.

Brewster, N. Y.—The New York Central R. R. Co. (Henning Fernstrom, Ch. Engr., New York, N. Y.) is reported to have engineers at work at different points in Connecticut surveying for a double track road from its Harlem branch at Brewster, N. Y., to Albany, N. Y., and will erect a trestle about 400 ft. high, near Thomaston, if a grade of 1 per cent. is not exceeded.

Binghamton, N. Y.—Surveyors in the employ of the Binghamton & Southern R. R. Co. are reported to be in this city, making surveys for an entrance into the city.

New York, N. Y.—Bids will be received by A. J. County, Secy. Pennsylvania, New Jersey & New York R. R. Co., 85 Cedar St., N. Y. City, on Mar. 6, for the construction of tunnels under Bergen Hill within the State of New Jersey, as advertised in The Engineering Record.

Franklin, N. C.—The Tallulah Falls R. R. Co. (W. S. Erwin, Gen. Mgr., Cornelia, Ga.) is reported to have decided to begin at once to extend its line to Franklin and Knoxville, Tenn.

Guthrie, Okla. Ter.—A charter has been granted to the Kansas, Oklahoma & Poteau Ry. Co., of Guthrie, with a capital of \$10,000,000. Incorporators: J. W. McNeal and T. J. Lowe, of Guthrie; J. M. Day, of Nevada, Mo.; R. A. Bowden, of Sapulpa, Ind. Ter., and others. The railroad will be constructed through Logan, Lincoln and Payne Counties into the Creek Nation to Wagoner, Ind. Ter. Another line will be constructed at or near the Kansas line in the northwestern portion of the Osage nation, running through Pawnee County, Okla., into the Creek nation and through the Creek nation, where it will intersect the Guthrie line. From there it will go through the Cherokee and into the Choctaw nation to Poteau, Ind. Ter.

Philadelphia, Pa.—The Baltimore & Ohio R. R. Co. (D. D. Carothers, Ch. Engr., Baltimore, Md.) is reported to be planning to lay out freight yards here.

Diball, Tex.—Chas. McSweeney, of Houston, is stated to have secured the contract to grade the Texas Southeastern Ry. from Diball to Neches River, a distance of about 10 miles.

Ladysmith, Wis.—McIntosh Bros., of Milwaukee, have secured the contract to build 45 miles of road for the recently organized Owen & Northern R. R. from Ladysmith southwest through Chippewa, Gates, Taylor and Clark Counties.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Ft. Morgan, Ala.—Bids will be received by Lieut. G. T. Perkins, Q. M., U. S. A., on Feb. 27, for the construction of a boat-house at Ft. Morgan, as advertised in The Engineering Record.

Annisston, Ala.—Bids will be received Feb. 25 by J. K. Kox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for low-pressure, steam-heating apparatus for U. S. Post Office here.

Montgomery, Ala.—S. T. Westcott, Clk. Bd. Revenue, is reported, has been authorized to receive bids for the erection of a 2-story annex to the Montgomery County Court House.

Magnolia, Ark.—Bids will be received by the Comrs. of Columbia County about March 11, for the erection of a court house. Architect, Wm. S. Hall, of Jackson, Miss.

Oakland, Cal.—The Trus. of the Merritt Hospital have decided to begin the construction of the buildings which will comprise the free hospital for incurables for which an endowment fund was left by the late Catharine M. Garcelon, a sum amounting to \$500,000. The plans call for the construction of 6 two-story brick and stone fireproof buildings, consisting of a central pavilion which will be used for administration purposes, 4 hospital pavilions and 1 operating pavilion. It is the purpose of the Trus. to erect at present only the main south pavilion and the operating pavilion, the cost of these two to be about \$100,000.

Washington, D. C.—B. Stanley Simmons, 523 9th St., N. W., on Jan. 26, was awarded first prize in the architectural competition for plans submitted for the proposed new Police Court Bldg., which is to be erected at 6th and D Sts. The building is to be of brick with terra cotta trimmings and is estimated to cost \$70,000.

Bids will be received by Lieut.-Col. John W. Summerhayes, Q. M., U. S. A., on March 6 for the construction of a mess hall and dormitory at the U. S. Soldiers' Home, Washington, as advertised in The Engineering Record.

The Bureau of Yards & Docks, Navy Dept., is reported to have sent to Speaker Cannon, through the Sec. of the Treasury, an estimate for \$100,000 additional for the Washington Navy Yard. Of this appropriation \$78,000 is estimated for the quay wall, \$25,000 for roofing the foundry buildings and \$87,000 for the proposed sight-shop buildings.

Chickamauga Park, Ga.—Bids are wanted Mar. 1 for constructing, including plumbing, heating and gas piping, several buildings at Ft. Oglethorpe, Chickamauga Park. Address Capt. C. Nixon, Q. M., U. S. A., Custom House Bldg., Chattanooga, Tenn.

Chicago, Ill.—The site, bounded by Augusta, Elmwood, Scoville and Thomas Sts., has been selected by the Oak Park Hospital Assoc. (N. A. McClary, pres.) for the location of its building, which is to be erected next spring at a cost of \$100,000.

The Passavant Hospital Assn. has been organized, with Jas. H. Eckels, Arthur L. Farwell, and Arthur B. Wells as directors, for the purpose of enlarging the building of the Passavant Memorial Hospital at 194 Superior St.

De Kalb, Ill.—The following are the bids opened on Jan. 30, by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction complete of U. S. Post Office at De Kalb: Bulley & Andrews, Chicago, \$78,500; C. E. Carson, Chicago, \$57,639; E. P. Strandbury, Chicago, \$69,640; C. H. Glendale Co., Chicago, \$59,750; Liver & Rampaulth, Chicago, \$75,454; Standard Constr. Co., Chicago,

\$60,960; G. Maffoli, Rockford, \$72,804; Johnson Montelth, Rockford, \$70,800; Lauritzen Bros., Fergus Falls, Minn., \$61,000; Newman & Hoy, St. Paul, Minn., \$61,955; Latimer & Bennings, Kansas City, Mo., \$59,534; Kramer Mfg. Co., Richmond, Va., \$73,305; Ed. Henry, Tipton, Ind., \$66,345; W. J. McAlepine, Dixon, \$58,550, and Butler Bros., St. Paul, Minn., \$62,000.

Evansville, Ill.—The Pub. Library Bd. has accepted plans for a 2-story Bedford stone library, which is to be erected at Orrington Ave. and Church St., at a cost of \$100,000.

Des Moines, Ia.—The Bd. of Superv. has awarded the contract for work in connection with the court house as follows: Ventilating and heating and gas piping and plumbing to L. H. Kurtz of Des Moines, at about \$44,240; roofing and metal work to Gateway City Steel Tank & Roofing Co., of La Crosse, Wis., at \$9,794, and steel and fireproofing tower to H. W. Schlueter, of Chicago, Ill., at \$10,320.

Ft. Des Moines, Ia.—The following are reported to be the lowest bids received for constructing various buildings at this post, bids for which were opened Jan. 19 by Capt. L. Hardeeman, quartermaster: W. J. Zitterfelt, Webster City, wagon shop, \$2,166; addition to quartermaster's storehouse, \$7,805. Atkinson & Co., Marshalltown, double set lieutenant's quarters, \$48,000. C. E. Carson, Chicago, Ill., field of officers work to Gateway City Steel Tank & Roofing Co., \$32,000. Dub Tusan, Des Moines, civilians' quarters, \$4,786. Franzen & Co., St. Paul, 2 double barracks, \$88,200. Chas. Weitz & Sons, 2 stable guard houses, \$6,716. Capital City Brick & Pipe Co., 4 cavalry barns, \$22,016.

Ft. Riley, Kan.—Arrangements have been made for the erection of a veterinary hospital and a commissary warehouse here, the cost of the two to be about \$80,000.

Lexington, Ky.—The Park Comrs. have decided to recommend to Mayor Combs that he employ Prof. F. Paul Anderson and Prof. John Faig, both of the Mechanical Engineering Dept. of Kentucky State College, to prepare plans and estimates for the auditorium which is to be erected in Woodland Park, and for which \$20,000 have been issued.

Franklin, La.—The Police Jury has decided to erect a \$20,000 court-house here.

Boston, Mass.—The Trus. of the Mass. Homeopathic Hospital, have purchased a site on E. Concord St., and intend erecting a new hospital.

Marlboro, Mass.—The plans of Allen, Collins & Berry, of Boston, are stated to have been accepted for an armory, to cost \$23,000.

Albert Lea, Minn.—The following are the bids opened Jan. 31, by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction complete of the U. S. Post Office at Albert Lea: Lauritzen Bros., Fergus Falls, Minn., \$29,040; Northern Constr. Co., Milwaukee, Wis., \$32,974; Chas. Skoogland, St. Paul, \$26,779; Prince Constr. Co., Minneapolis, \$34,500; H. N. Leighton, Minneapolis, \$35,855; J. H. Donohue, St. Paul, \$25,499; J. W. Miller, St. Paul, \$29,700; Butler Bros., St. Paul, \$25,700; H. H. Paine, Albert Lea, \$28,000, and O'Neill & Son, Faribault, \$26,819.

Minneapolis, Minn.—The Park Bd. has awarded the first prize for the plans for the pavilion to be erected in Minnehaha Park, at a cost of \$10,000, to Downes & Bads.

Biloxi, Miss.—The Standard Constr. Co., of Chicago, Ill., has secured the contract for erecting a new U. S. Post Office, at \$1,970 for the building, and \$18,500 additional for marble columns.

Jackson, Miss.—A site for the Methodist Orphanage has been donated and subscriptions for constructing buildings, to cost about \$30,000, have been partly raised. Architect not yet engaged. Address Rev. A. F. Watkins, Secy. Bldg. Com., Jackson.

St. Louis, Mo.—The Bd. of Mgrs. of the Evangelical Hospital Assoc., at 4117 W. Belle Pl., have decided to erect a hospital at a cost of about \$77,000. Rev. J. F. Klieck, Pres.

Ft. Harrison, Mont.—Bids are wanted Feb. 16 for constructing one civilian employees' quarters and 2 single sets N. C. S. O. quarters; bids will be received separately for plumbing, heating and electric wiring. Capt. I. C. Jenks, Q. M.

Hastings, Neb.—Bids will be received until March 1 by the Superv. Archt. Treas. Dept., Washington, D. C., for the low pressure steam heating and ventilating apparatus, complete for the U. S. Post Office here, as advertised in The Engineering Record.

Vandenberg, N. J.—Bids will be received March 15 by the Co. Bldg. Com. for jail equipment, including cells, gratings, etc., for county court house. Rankin, Kellogg & Crane, Archts., 1012 Walnut St., Philadelphia, Pa.; Irving Buckle, Chmn.

New York, N. Y.—The following are the bids opened on Jan. 26, by Wm. McAduo, Police Comr., for furnishing labor and material (except vent. piping) for the new building to be used as Police Headquarters to be erected on Grand, Centre and Broome Sts.: Chas. H. Peckworth, \$688,775; Gillespie Bros., 1135 B'way, \$662,250 (awarded contract, according to press reports) Buckley Realty Constr. Co., \$669,999; P. Gallagher, 156 5th Ave., \$663,900; Ryan & McFerran, \$724,775; R. L. Cunningham, \$690,000; Thos. E. Leahy, Constr. Co., \$744,370, and Thos. Cockerill, \$724,500.

Brooklyn, N. Y.—Bids will be received Feb. 15 by the Dept. Bd. of Health, N. Y. City, for furnishing material and erecting a cold storage building at Kingston Ave. Hospital. Thos. Darlington, M. D., Pres.

Oswego, N. Y.—The erection of a new armory here, at a cost of about \$100,000, is reported under consideration.

*Items marked thus give the names of parties awarded contracts.

Albany, N. Y.—Bids will be received Feb. 20 by the Bd. Contracts and Supply for furnishing material and erecting a small hospital, including mason, carpenter, plumbing and heating work. Isidore Wachman, Clk.

Ft. Caswell, N. C.—Bids will be received by R. H. Williams, Q. M. U. S. A., on Feb. 27 for constructing, plumbing, and wiring gymnasium, etc., here, as advertised in The Engineering Record.

Elizabeth City, N. C.—Bids will be received by the Superv. Archt., Treas. Dept., Washington, D. C., Mar. 20 for the construction, complete, of the U. S. Post Office and Court House at Elizabeth City, as advertised in The Engineering Record.

Raleigh, N. C.—A bill has been introduced in the Legislature to appropriate \$75,000 for the erection of a 5-story granite, fireproof building for records, Hall of History, State Library, offices of Superintendent of Public Instruction, and a number of other State offices. Governor Glenn sent a special message, urging favorable action on the bill, which has the endorsement of the State Board of Public Buildings and Grounds.

Canton, O.—The Com. of the Bd. of Pub. Safety has recommended the erection of a new engine house at Crystal Park, to cost \$25,000.

Oberlin, O.—President King of Oberlin College, it is stated, has announced that Andrew Carnegie has given \$125,000 to the college to erect a library to meet the needs of the college and town.

Cincinnati, O.—Harry Hake, Union Trust Bldg., is about to present to the Bd. of Pub. Service plans for the erection of 6 new fire engine houses and the remodeling of several old buildings, the total cost of the improvement to be about \$350,000.

Pittsburg, Pa.—The Grand Jury on Jan. 24 favorably recommended the issue of \$600,000 bonds by the county for the improvements and extensions to the jail now being made.

Philadelphia, Pa.—Bids will be received Feb. 13 by Brodick & Hastings, Archts., 325 Chestnut St., for constructing a steam heating plant and cement floor at Philadelphia Museum, 34th St. and Vintage Ave.

Washington, Pa.—The following are the bids opened on Jan. 25 by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction of the U. S. Post Office at Washington, Pa.: H. L. Kreusser, Pittsburgh, \$49,350; A. Spates Brady, Fairmount, W. Va., \$49,550; Michael & Hentz, Cleveland, O., \$49,997; Hamilton Iron Co., Fairmount, W. Va., \$57,850; F. L. Stevenson Contr. Co., Dallas, Tex., \$45,400; W. E. Spier, Washington, D. C., \$47,200; Thos. Reilly, Philadelphia, \$41,713; C. H. McCann Co., Philadelphia, \$45,920; O. & S. Wilson Co., Pittsburgh, \$60,530; Richardson & Burgess, Washington, D. C., \$42,750; Mankin Contr. Co., Richmond, Va., \$39,964; Fissel & Wagner, New York, N. Y., \$40,376; A. B. Stannard, New York, N. Y., \$49,964; Commonwealth Bldg. Co., Pittsburgh, \$49,757; Walker & Co., Washington, Pa., \$51,200; G. B. A. Wolf, Hagerstown, Md., \$59,563; and Vesta Stewart Russell Co., Washington, Pa., \$62,500.

Camden, S. C.—T. C. Thompson & Bro., of Birmingham, Ala., it is reported, have received the contract to erect the court house (bids opened Jan. 18), at about \$31,000. Edwards & Walter, of Columbia, are the archts.

Sturgis, S. D.—It is reported that 2 buildings will probably be erected at Ft. Meade this year, a single barracks costing \$30,000, and a band stable, costing \$6,500.

Yankton, S. D.—Hess & Rau, of Watertown, S. D., have secured the contract for heating the U. S. Post Office (bids opened Jan. 18), for \$2,200.

Sherman, Tex.—Bids will be received by the Superv. Archt., Treas. Dept., Washington, D. C., March 23, for the construction, except heating apparatus and wiring and conduit system of the U. S. Post Office and Court House at Sherman, as advertised in The Engineering Record.

Laredo, Tex.—Bids will be received Mar. 21 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for constructing (except elevator and wiring) U. S. Post Office, Court House and Custom House here.

Edna, Tex.—Plans, specifications and bids will be received until March 1 by the Co. Comrs. for a court house, the cost not to exceed \$45,000. For further information apply to the County Judge.

Ogden, Utah.—The following are the bids opened on Feb. 1 by the Superv. Archt., Treas. Dept., Washington, D. C., for erecting the U. S. Post Office and Court House at Ogden: Standard Constr. Co., Chicago, Ill., \$182,000; Thos. Lowell, Denton, Tex., \$155,375; A. & J. McDonald, Salt Lake City, \$207,731; Campbell Bldg. Co., Salt Lake City, \$179,600; Oliver Hodgson, Salt Lake City, \$201,769; and J. W. Weise, South Omaha, Neb., \$167,450.

Marion, Va.—Archit. Frank P. Millburn, of Columbia, S. C., writes that plans will probably be ready about Mar. 15, for the erection of a court house for Smyth County.

Winchester, Va.—A committee, of which A. M. Baker is a member, has been instructed to receive bids for erecting the John Handley Memorial Library, the cost not to exceed \$100,000.

Seattle, Wash.—The Armory Bd. has agreed upon the plans submitted by Kerr & Rogers, of Hancock Bldg., for the armory which it is proposed erecting at a probable cost of \$100,000.

North Yakima, Wash.—Daniel Sinclair, Chmn. Co. Comrs., writes that the proposed court-house will cost about \$50,000. No bids called for yet.

Madison, Wis.—The Capitol Bldg. Com., it is reported, favors the plans of Cass Gilbert, of New York City, for the new capitol; estimated cost, \$6,000,000. No definite decision has as yet been made.

Prince Albert, N. W. T.—Lemoine & Fortin, of Pembroke, Ont., it is reported, has received the contract to erect a government building here, at a cost of about \$80,000. It is to be 2½ stories high with mansard roof.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Birmingham, Ala.—W. H. Kettig, representative of the Crane Co., it is stated, has announced that the company will erect a building either 2 or 3 stories high, of brick to replace the present structure, which was damaged by fire on Jan. 25, the cost to be about \$50,000.

Decatur, Ala.—Cowell & Love, of Huntsville, Ala., are preparing plans for a theater to be erected in this city at a cost of \$30,000.

Douglas, Ariz.—It is stated that bids will be received until Feb. 10 for erecting a Y. M. C. A. bldg. Geo. D. McGill, Secy Bd. Trus.

Pine Bluff, Ark.—It is reported that the 2 buildings occupied by Wolf Nichols, on 226 Main St., have been destroyed by fire.

San Francisco, Cal.—Plans have been completed by Henry A. Schulze, Hayward Bldg., for a 3-story brick and frame club-house which is to be erected on Franklin and Sutter Sts. for the Century Club, at a cost of \$40,000.

Chicago, Ill.—Thaddeus H. Howe has leased the 6-story building at Lake St. and Fifth Ave., 80x114 ft., and will remodel the structure into a business building, at a cost of about \$50,000.

J. F. Knudson, 801 W. North Ave., has completed plans for a factory to be built at Francisco Ave. crossing of the Chicago & Northwestern R. R. tracks for the Armstrong Bros. Tool Co. The building will be 2 stories high, 60x180 ft., of mill construction, and cost about \$35,000.

Claus A. Carlson is having plans prepared for a store and office building to be erected at South Park Ave. and 64th St., after plans by A. G. Lund & Co., 602 W. 63d St. It will be one and two stories high, 80x105 ft., and cost about \$30,000.

The Salvation Army has purchased the property at 556-560 W. Madison St., and will improve it with a 6-story building, to cost \$80,000.

Elgin, Ill.—It is stated that all the fraternal orders of the city, especially the Court of Honor, are interested in the erection of a 1-story brick and stone Temple of Fraternities, which it is proposed erecting at a cost of \$20,000.

Indianapolis, Ind.—Daggett & Co., Marion Bldg., have prepared plans for an 8-story brick warehouse of mill construction for W. J. Holliday, to cost \$40,000.

South Bend, Ind.—Freyermuth & Maurer, 138 N. Michigan St., it is stated, are the archts. for a vaudeville theatre which is to be erected on St. Joseph St., at a cost of about \$10,000. It is to be a 2-story brick and stone building, 50x150 ft., and is to be known as the Olympic. Emmet C. Keane, of Chicago, Ill., it is stated, will conduct the theatre.

Wabash, Ind.—The Eagles, of this city, contemplate building a theatre to cost \$40,000.

Vincennes, Ind.—It is reported that the Elks will soon award the contract to erect a building in this city, to cost \$40,000.

Tulsa, Ind. Ter.—The Robinson Investment Co. (W. N. Robinson, Pres.), is about to be incorporated with a capital of \$75,000, and intends erecting a 5-story hotel here.

Des Moines, Ia.—Hallet & Rawson, 615 Walnut St., have prepared plans for a club-house for the Golf and Country Club; cost, \$50,000.

Ballard & Meek will erect a 3-story business building, 22x132 ft.; cost, \$15,000. Proudfoot & Bird, Archts., 702 Youngerman Bldg.

The Iowa National Bank has purchased property on 6th and Locust Sts., and will later on erect on this site a fireproof office building.

The Capital City Investment Co., it is stated, has announced its intention to erect on 6th and Grand Aves., a 3-story brick business block to cost \$14,500.

W. F. Mitchell & Co., 315 9th St., it is stated, have received the contract to erect the Meek & Ballard Bldg., on 6th Ave. It is to be 3 stories high, 22x132 ft., and will cost about \$22,000.

It is reported that Meek & Ballard are negotiating for the purchase of the Essex Bldg., and if secured, will remodel and enlarge it and install an elevator.

Iowa City, Ia.—It is stated that E. S. Ellsworth intends erecting a 3-story hotel at a cost of about \$40,000.

The Masonic Lodge of Iowa City, it is reported, intends erecting a building at a cost of about \$45,000. Address Secretary.

Sioux City, Ia.—Plans prepared by Winfred W. Beach, 721 Toy Bldg., for the Bolton Bldg., have been approved. They provide for a 3-story and basement brick store and office building to cost about \$30,000.

Plans are being prepared by G. W. Burkhead, Iowa Sav. Bank Bldg., for a 2-story and basement brick and terra-cotta, 50x100-ft. college building to be erected on 7th and Pearl Sts., for the National Business Training School, at a cost of \$10,000.

Marshalltown, Ia.—It is reported that a Masonic Temple is to be erected here at a cost of about \$100,000. J. L. Carney, Sec., Masonic Temple Assoc.

Sterling, Ky.—Several buildings, including the Masonic Temple, it is reported, have been destroyed by fire.

New Orleans, La.—It is stated that A. Baldwin & Co. will erect a 4-story brick warehouse on Howard Ave. and Poe St., at a cost of \$22,900.

Baltimore, Md.—A building permit has been issued for a 1-story brick and stone structure, which is to be erected at South and Lombard Sts., for the Farmers' & Merchants' National Bank, at a cost of about \$80,000. Baldwin & Pennington, Archts.; Welis Bros. Co., of New York City, are the builders.

A building permit has been granted to the Johns Hopkins Estate for the erection of a 5-story, 80x110-ft. building at Lombard and Light Sts., at a cost of \$60,000.

The officials of the Baltimore & Ohio R. R. have selected the plans submitted to H. D. Hale and Parker & Thomas, of Boston and Baltimore, Assoc. Archts., for their 13-story and basement 155x168-ft. office building which is to be erected on Charles and Baltimore Sts.

Holyoke, Mass.—The contract for an addition to the plant of the Farr-Alpaca Co., from plans of S. M. Green, has been awarded to Casper Ranger, 10 Bond St. The building will be a bonded warehouse, and will be of mill construction, 6 stories high, 108x59 ft., with freight elevator, sprinkler system and patent sliding doors. It has been decided to install a steam-turbine and an electric generator for power.

Greenfield, Mass.—W. B. Reid, of Holyoke, has completed plans for an apartment block for F. O. Wells. It is to be fireproof, and will be built entirely of hollow concrete blocks; it will be 3 stories high, 100x153 ft., with a fireproof and gravel roof, concrete foundation, steam heat, gas and electric light, and all modern conveniences.

Hancock, Mich.—The committee appointed by the Elks, has decided to recommend the erection of an Elks Temple, 50x100 ft., 3 stories high, estimated to cost \$30,000.

Winona, Minn.—Plans are being prepared for a \$50,000 Y. M. C. A. building. R. E. Squires, Secy.

Meridian, Miss.—A topographical survey is being made for new union passenger station for the Queen & Crescent R. R. (Edw. Ford, Div. Supt., Vicksburg) and other railways.

St. Louis, Mo.—A building permit has been granted to the Anheuser-Busch Brewing Assoc. for excavation and masonry for a stock-house, to cost \$20,000, and also for a 1 and 2-story private stable to be erected at Dorcas, Lynch, S. 2 and S. 3d Sts., at a cost of \$75,000.

Kansas City, Mo.—Plans have been prepared, according to report, for a theater to be erected by the Helm Theater Co., at Walnut and 12th Sts.

Omaha, Neb.—The Omaha Commercial College is having plans prepared by J. B. Mason, 508 Brown Bldg., for a \$40,000 business college.

Camden, N. J.—It is reported that M. W. Taylor Amusement Co. proposes erecting a \$50,000 theater on Market St.

New York, N. Y.—The Trus. of the First Presbyterian Church, it is stated, intend erecting a 12-story business building and parish house on 5th Ave., between 11th and 12th Sts., to cost about \$50,000.

The members of the New York Club, it is reported, have purchased a site on 45th St., between 5th and 6th Aves., on which it is proposed erecting a new clubhouse to cost about \$400,000.

Binghamton, N. Y.—It is reported that the Y. M. C. A. has announced that competitive plans will be received by the Pres. until about Apr. 1 for the Y. M. C. A. building which is to be erected on Washington St., the cost not to exceed \$100,000. Further information may be obtained by applying to E. B. Searles, Gen. Secy.

Rochester, N. Y.—It is reported that Dr. J. J. A. Burke proposes erecting an 8-story hotel on East Ave.

Albany, N. Y.—The Trus. of the Albany Institute and Historical and Art Society are contemplating the erection in the spring of a building, at a cost of about \$50,000.

Charlotte, N. C.—H. C. Morrison, of Augusta, Ga., it is reported, has received the contract to erect a 2-story brick depot for the Southern Ry., at a cost of about \$60,000.

Dayton, O.—The local Aerie of Elks, it is stated, is contemplating the erection of a building on 5th St., to cost about \$25,000.

Peters & Burns, Kuhns Bldg., are preparing plans for a 3-story building to be erected at 5th and Brown Sts.

Springfield, O.—The Bd. of Trus. of the Odd Fellows' Home Here is said to be contemplating the erection of an addition to the home at a cost of about \$40,000.

Cincinnati, O.—S. T. Nelson & Co., intend erecting a 4-story building on 4th and Elm Sts., to cost about \$25,000. Boll & Taylor, 4th and Walnut Sts., are the archts.

C. S. Harrison, First Nat'l Bank Bldg., writes that it is proposed to erect a 12-story building on 4th, Elm and McFarland Sts. There will be no power plant required.

Cincinnati, O.—G. B. Nicholson, of Cincinnati, Ch. Engr. of the Queen & Crescent Route, it is stated, has completed plans for 2 freight warehouses which are to be erected of concrete and brick, at an estimated cost of \$250,000.

Toledo, O.—Local press reports state the original plans for the 16-story store and office building which is to be erected on Madison and Huron Sts., and to be known as the "Nicholas," have been revised, and the contract for its erection awarded on Jan. 24 to C. M. and A. L. Spitzer to A. Bentley & Son, of Toledo, at about \$550,000.

It is reported that Geo. H. Ketcham states that the proposed Rachel Ann Hotel will have an 8-story addition instead of 6, as originally contemplated.

Bids for the steam heating plant for the Y. M. C. A. building were opened by the trustees, Jan. 25, and the contract awarded to the Shaw-Kendall Eng. Co., 3 S. St. Clair St., to \$16,500.

Cambridge, O.—It is reported that Eldridge-Higgins Wholesale Grocery Co., Columbus, will erect a \$40,000 business building in this city.

Canton, O.—Louis Gibbs & Sons will erect a 4-story business block of brick and stone to cost \$15,000. Guy Tilden, Archt., Shaeff. Bldg.

Snyderdowntown, Pa.—The Odd Fellows has agreed to build 3 orphanage buildings, at cost of \$50,000.

Allentown, Pa.—The Allentown Hotel Co. is about to be organized with a capital of \$500,000 for the purpose of erecting a 7-story, 98x150 ft. hotel on 6th and Linden Sts., to be known as the Hotel Majestic.

East Liberty, Pa.—The Pennsylvania R. Co., it is reported, has awarded the contract for the excavating and foundation for the depot which is to be erected here, to the Columbia Contr. Co., at about \$100,000.

Bids are being received for the superstructure of the above building and the contract is stated, will soon be awarded.

Philadelphia, Pa.—A building permit has been granted to Herman Voigt, 2923 Girard Ave., to erect a 5-story brick warehouse, 100x57 ft., at 56th and Paschall Ave., at a cost of \$18,000, and to Appleton & Burrell, 126 Chancellor St., to erect a 5-story brick factory 20x100 ft., at 1200 Race St., cost \$18,000.

A building permit has been granted to Armstrong & Latta, to remodel the interior of the Pennsylvania R. R. Co.'s cold storage warehouse at Pennsylvania Ave. and Spruce St., at a cost of about \$50,000.

McKees Rocks, Pa.—J. A. Atwood, of Pittsburgh, Ch. Engr., Pittsburgh & Lake Erie R. R. Co., writes that the contract for erecting a Y. M. C. A. building at McKees Rocks (bids opened Jan. 16) has been awarded to W. F. Trimble & Sons Co., 1719 Greenwood St., Allegheny. The building will cost about \$35,000.

Aiken, S. C.—A. P. Childs, of Castleboro, Vt., and E. W. Gibson, and F. W. Childs, of Brattleboro, Vt., are said to be members of a syndicate of 10 men, including several from South Carolina, who will erect a winter tourists' hotel 27 miles from here, to cost about \$25,000.

Memphis, Tenn.—F. B. Young, 1219 Mississippi Ave., it is stated, has received the contract to erect two 3-story brick stores on Front St., at a total cost of \$60,000.

Knowville, Tenn.—Thos. Morgan, of Atlanta, Ga., is said to be the archt. for 10 story fireproof building, which the officials of the Mechanics' National Bank intend erecting.

Knowville, Tenn.—J. M. Dunn, 116 W. Baxter Ave., it is reported, has received the contract to remodel the building of the Southern Bldg. & Loan Co., the cost to be about \$25,000.

The Bldg. Bd. of the Central Labor Union (J. A. Witt, Chmn.), it is stated, are taking preliminary steps toward the erection of a labor temple here, the cost, including ground, to be about \$25,000.

Chattanooga, Tenn.—The Hamilton Lodge No. 243, I. O. O. F., it is stated, has had plans prepared and intends erecting a 3-story building on Montgomery St.

Roanoke, Va.—J. C. Nesbitt, of Roanoke, it is reported, has received the contract to erect a general office building in this city for the Norfolk & Western R. R., at a cost of \$125,000.

Richmond, Va.—Wm. Miller, it is stated, will erect at 105 E. Broad St. 3-story brick stone and steel store building at a cost of \$20,000.

Spokane, Wash.—D. B. Fotheringham, Van Volkenberg Bldg., it is stated, has received the contract to erect a 6-story brick and stone trimmed building on Riverside Ave. and Washington St., for M. Sellar & Co., at a cost of about \$50,000.

Walla Walla, Wash.—It is stated that the Northern Pacific Theatrical Assoc. intend erecting a theater here at a cost of about \$30,000.

Seattle, Wash.—John Graham, Globe Bldg., has prepared plans for a 4-story store building which is to be erected at Pike St. and 4th Ave., by Geo. Kinnear. It is to be of steel terra cotta and concrete, and is to cost about \$175,000.

Madison, Wis.—J. T. W. Jennings, Univ. of Wis., it is reported, is the archt. for the business building which C. R. Van Hise will erect at a cost of \$30,000.

Milwaukee, Wis.—The Pabst Brewing Co. it is reported, intends remodeling the St. James' Hotel, at a cost of about \$20,000. Messmer & Sons, 473 E. Water St., are the architects.

*Items marked thus give the names of parties awarded contracts.

NEW YORK, N. Y.

Columbia St, 6-story br and stone facade and storage bldg; c, \$165,000; o & a, De & Co.
 6 E Houston St, 6-story br and stone store; c, \$32,000; o, Abrahamson; a, Geo F. Pelham.
 University Pl, 6-story br and stone loft; c, \$60,000; o, Sailors' Snug Harbor; a, Chas. Voiz.
 6 E 119th St, 6-story br and stone store; c, \$35,000; o, Raphael Kurzrok; a, Jorenburger & Straub.
 12 2d Ave, 6-story br and stone store; c, \$52,000; o, Haft & Williams; a, Geo F. Pelham.
 5th St and Amsterdam Ave, 2 6-story nd stone stores and tenements; c, \$25,000; a, ipman & Gold; a, Horenburger & Straub.
 30th Ave and 137th St, 2 6-story br and e stores and tenements; total c, \$80,000; e Doctor; a, John Hauser.
 8th St and Union Ave, 5-story br store tenement; c, \$75,000; o, The Brown Co.; a, Moore & Landsiedel.
 31st St and Melrose Ave, 5-story br store tenement; c, \$20,000; o, Adolph Sussman; a, Chas. Stegmayer.

CHURCHES AND DWELLINGS.

otes Arranged Alphabetically by States.

Brunswick, Ga.—Jeff Darling has received contract to erect the Methodist Church a cost of \$13,000.

Chicago, Ill.—The members of the Buena morial Presbyterian Church have decided to build an edifice and have \$20,000 available. E. Youngberg, 218 La Salle St, is preparing plans for a residence which is to be on Woodward Ave near 49th St, for al. A. McLean, Vice-President of the National Packing Co. It will be a 3-story structure, 40x48 ft, of pressed brick, with slate i, and cost \$30,000.

I. W. Duncanson will build an apartment use at Winthrop and Lawrence Aves, after as by W. G. Krieg, 84 Washington St. It e 3 stories, and is estimated to cost 0,000.

Collins & Morris are having plans prepared a 3-story apartment house, to be erected Indiana Ave, and 42d St., at a cost of 0,000.

Brighton, Ill.—W. F. Gubbins, Chicago, Ill., prepared plans for a \$50,000 edifice for St. nes' R. C. Church.

Elkhart, Ind.—It is stated that A. W. Cole, Chicago, Ill., is preparing plans for a \$30,000 edifice for the First Presbyterian Church.

Ft. Wayne, Ind.—It is reported that the mbers of the First Baptist Church are pre- ing to remodel the church at a cost of 5,000. Rev. J. N. Field, Pastor.

Muncie, Ind.—Prof. Henry S. Peacock of the Muncie High School, it is reported, will ect a 3-story flat on Jefferson St. in the ring to cost about \$10,000.

Emmetsburg, Ia.—P. R. Wells, of Emmets- it, is reported, has received the contract ect the R. C. Church, at \$24,500.

Cynthiana, Ky.—J. R. Polindexter, of Cyn- ana, it is reported, has received the con- act to erect a Methodist church here at a t of about \$14,700.

Boston, Mass.—Plans have been filed by J. Connelly, 93 Dale St., owner and lder, for a 3-story brick, 3-family double ck, to be erected on Commonwealth Ave., ar Allston St., estimated cost, \$25,000; also John C. Foley, 6 Terrace St., for Agnes Sweeney, for a block of 3 brick and stone gle-family dwelling houses, on Colliston ad, near Corey Road.

Hattiesburg, Miss.—The Main St. Metho- st Church, it is stated, intends erecting a ck edifice to cost \$20,000.

Kansas City, Mo.—Geo. Carman, 309 Hall dg, has prepared plans for brick apartments Linwood Boule, and Troost Ave. for A. Mosler, to cost \$45,000.

Dayton, O.—F. L. Sutter, 33 Lewis Bldg., has en- gaged to prepare plans for a 6-story artment house which Thos. P. Gaddis will ect at 5th and Wilkinson Sts. Probable st, \$50,000.

Cincinnati, O.—Plans have been submitted o Bldg. Comr. Tooker for a 3-story concrete nd brick flat building to be erected at Wood- urn and Gilbert Aves. and St. Ledger Pl., t a cost of \$50,000. Chas. Mayer, owner. Reports state that Jos. G. Sinkamp & o., 24 E. Court St., are preparing plans or a \$50,000 flat which is to be erected on elford and Bryant Aves.

Elnzer & Anderson, Ingalls Bldg., have pre- are plans for a residence which is to be ected on Grandin Road by Leopold Kley- bld, Pres. of the German Western Bank. Es- timated cost, \$50,000.

West Alexandria, O.—The Krame Mfg. o., of Richmond, it is reported, has re- ceived the contract to erect a church here at cost of \$51,000.

Belleuve, Pa.—Hays Bros. & Dodds, it is tated, have received the contract to erect he Methodist Church at about \$48,250.

Sharpsburg, Pa.—The Presbyterian Church ongregation, it is reported, has decided to erect a new edifice at a cost of about \$27,000, address pastor.

Allentown, Pa.—Plans are being prepared or a 3-story residence, 22x77 ft., for A. Ed- w. Barber.

Aberdeen, S. D.—The members of the Methodist Church are considering the erec- tion of an edifice at a cost of \$25,000.

Waco, Tex.—The Columbia St. Baptist Church members, it is reported, have an- nounced that they intend erecting a new edifice at a cost of \$30,000.

Ft. Worth, Tex.—The Mulkey Methodist Church, it is stated, is to be remodelled and enlarged at a cost of about \$20,000. Geo. Mulkey is a member of the committee having the matter in charge.

A committee, of which J. C. Smith is a member, has been appointed to select a site on which it is proposed erecting a Methodist Church in the 8th Ward at a cost of \$30,000.

NEW YORK, N. Y.

226 E 83d St, 6-story br and stone tenements; c, \$40,000; o, Julius Weinstein; a, Bern- stein & Bernstein.

114th St and Riverside Drive, 2 6-story br and stone tenements; total c, \$280,000; o, Paterno Bros. Inc; a, Schwartz & Gross.

Northern Ave and 181st St, 3-story stone and frame dwell; c, \$30,000; o, Susan B. Kingsley; a, Chas. Brendon.

Brook Ave and 139th St, 6-story br tenement; c, \$50,000; o, Julius H. Seymour; a, L. A. Goldstone.

Concord Ave and 151st St, 4 5-story br tenements; total c, \$150,000; o, Anthony Mc- Owen; a, Harry T. Howell.

SCHOOLS.

*Notes Arranged Alphabetically by States.

Alaska.—President Roosevelt, on Jan. 27, signed the bill providing for the construction and maintenance of schools and roads and the care of the insane in the territory.

Phoenix, Ariz.—Bids will be received by Chas. W. Goodman, Supt. U. S. Indian School, for furnishing and delivering at school as required, during fiscal year ending June 30, 1905, about 13,200 ft. lumber, 15,000 shingles, 58,000 brick, 130 bbls. lime, 100 bbls. cement, 300 ft. sewer pipe, 1 water heater, a quantity of pipe, etc.

Alhambra, Cal.—It is stated that bids are wanted Feb. 14 for erecting a high school. A. C. Smith, Archt., 218 S. Bway, Los Angeles; F. E. Williams, Clk. Bd. Educ.

New Haven, Conn.—G. T. Hewlett, Secy. Bd. Educ., writes that local architects have been invited to submit competitive plans on Feb. 10 for an 18-room school; according to reports, the building proposed will cost \$65,000.

Washington, D. C.—Gleeson & Humphrey, of Washington, have secured the contract for erecting an 8-room school in Columbia Heights (bids opened Jan. 21), for \$41,950.

Atlanta, Ga.—A school is to be erected in the 8th Ward, the cost to be about \$17,500.

Chicago, Ill.—The Com. of Sites of the Bd. of Educ. has recommended the erection of 2 manual training high schools—one at Division and Sedgwick Sts., on the North Side, and the other at 62d St., 62d Pl., Jackson Park and Jefferson Aves., on the South Side, the cost in each case to be about \$400,000.

Chicago, Ill.—The Bldgs. and Grounds Com. of the Bd. of Educ., on Jan. 27, it is stated, ordered the erection of new public schools and additions to schools in congested districts which will aggregate in cost nearly \$3,000,000. The buildings include the following: Lyman Trumbull Manual Training, \$400,000; 63rd and Jackson Ave. Manual Training, \$400,000; Graham school, rebuilt, \$175,000; Jenner School, 12 room and assembly hall addition, \$80,000; Washburne School, twelve room and hall addition, \$80,000; Rosehill School, 12 room and hall, \$125,000; Bernard Moos school, 26 rooms, \$175,000; Congress and 50th Ave., \$125,000; Bryant School, 12 rooms and hall, \$80,000; Kenmore and Sunny- side Aves., 26 rooms, \$175,000; Eowansville, 12 rooms and hall, \$125,000; N. S. Davis, 12 rooms and hall, \$125,000; Penn. Avers Ave. and 16th St., \$160,000; D. R. Cameron School, additional story, \$40,000; George W. Curtis, 12 room addition with hall, \$125,000; John M. Smyth, 6 room addition with hall, \$80,000; Dickens Ave. and 48th St., 12 rooms and hall, \$125,000; Jungman, 10 rooms and hall, \$90,000; Rogers, 18 rooms and hall, \$150,000; Andrew Jackson, 10 rooms and hall, \$90,000; Garfield, 6 rooms, \$50,000.

Pekin, Ill.—The Bd. of School Inspectors has decided to erect a 2-story and basement building north of the high school, to cost about \$10,000.

Freeport, Ill.—The citizens voted Jan. 23 to issue \$66,000 bonds for a new high school to be erected this summer.

Galeana, Ill.—E. Grimm, Chmn. Com. on Bldgs. Bd. Educ., writes that all bids opened on Jan. 24 for erecting a high school have been rejected, and new bids will be called for later.

Springfield, Ill.—The Bd. of Educ. has awarded the contract to erect the teachers' manual training school at 6th and Enos Aves. to A. A. De Vares, 907 N. 9th St., at \$55,879.

Springford, Ind.—Wm. S. Kaufman, of Richmond, has prepared plans for a school to be erected here, at a cost of \$10,000, address Matthew Williams, Trus. of Prairie Township.

Iowa City, Ia.—The first section of the new engineering building of the Univ. of Iowa will be erected here the coming summer. The Board of Regents has approved the plans of Proudfoot & Bird, of Des Moines, and the superintendent of construction. It is stated, will ask for bids at once. The Regents, it is reported, will expend the \$50,000 appropriated by the legislature, and go as far with the building as that money will permit. The building will be 3 stories high, of selected paving brick, and trimmed with stone.

Fairfield, Ia.—The citizens on Jan. 23 voted in favor of issuing \$25,000 bonds to erect a school in the 23d Ward.

*Items marked thus give the names of parties awarded contracts.

Murray, Ky.—The Trus. and stockholders of the Murray Male and Female Institute, it is stated, have agreed to add the school dist. in constructing a school to be owned by the School Dist., at a cost of about \$25,000.

Louisville, Ky.—The Finance Com. of the School Bd. has recommended the appropriation of \$10,000 for the erection of a manual training school to be erected in connection with the Central Colored High School.

Covington, Ky.—The Mother of God R. C. Church intends erecting a \$75,000 parochial school. Rev. Wm. Tappert, Pastor; S. Han- nard & Sons, of Cincinnati, O., are the archts.

New Orleans, La.—The Council Com. of Police and Pub. Bldgs., is about to report favor- ably on the erection of a school at Foucher, Amelia, Baronne and Dryades Sts., at a cost of \$40,000.

Northampton, Mass.—It is reported that the Trus. of Smith College, are contemplat- ing the erection in the spring of an admin- istration building with the recent gift of \$100,000 to the College by John D. Rocke- feller.

Boston, Mass.—The following are the bids opened on Jan. 25 by the School House Comn. for erecting a primary school opposite Franklin Park: Mock & Moore, \$65,900; Morrill Constr. Co., \$68,931; Whiton & Haines Co., \$69,177; W. N. Pike & Sons, \$70,888; Griffin & Farrell, \$71,600; B. F. Carroll & Co., \$72,748; Holmes Bros., \$72,775; J. J. Canich, \$72,797, and Henry Mc- Gahey, \$74,391.

Fairhaven, Mass.—It is reported that plans are being prepared for a granite high school, which, it is stated, Henry H. Rogers will erect here on Huttlesstone Ave., at a cost of about \$200,000.

Saginaw, Mich.—The brick Houghton School, it is stated, has been destroyed by fire.

Kansas City, Mo.—C. A. Smith, N. Y. Life Bldg., has prepared plans for 2 schools; one at 11th and Holmes Sts., to cost \$75,000, the other at 19th and Woodland Sts., to cost \$35,000.

Newark, N. J.—The Com. of Schoolhouses of the Bd. of Educ. has recommended the ex- penditure of \$650,000 for the erection of 4 new schools, and the purchase of a site for a new high school.

Kearny, N. J.—The Bd. of Educ. has been authorized to receive bids for erecting addi- tions to Schools Nos. 4 and 5 the total cost to be about \$49,000.

Harrison, N. J.—The Bd. of Educ. has ac- cepted the plans of Bower & Breitenbacher, of Harrison, for the Cross St. school, which is to be erected at a cost of \$40,000.

New York, N. Y.—The following are the bids opened on Jan. 30 by C. B. J. Snyder, Supt. School Bldgs., for general construction of School No. 42, Bronx Boro.: Fanning & Reilly, 150 Fifth Ave., \$221,660; Wm. Werner, \$237,562; Geo. Hildebrand, \$233,690; Guidone & Galardi, \$236,000; Pakk. Sullivan, \$242,000; Clarke & Stowe, \$233,400; Chas. H. Peckworth, \$229,972; Hartman & Horgan, \$245,843; Louis Wechsler, \$239,800; Thos. Cockerill & Son, \$238,900, and P. J. Walsh, \$238,000. The lowest bid for plumbing said building was submitted by Wm. C. Ormond, 14 Herbert St., Brooklyn, for \$1,539.

An ordinance was approved by the Mayor on Jan. 24 providing for the issue of \$550,000 corporate stock to provide means for im- proving, bettering and equipping public schools in the city.

Bids will be received Feb. 14 by C. B. J. Snyder, Supt. School Bldgs., for erecting outside iron stairs at the Hall of Bd. Educ., 500 Park Ave., Boro. Manhattan.

Brooklyn, N. Y.—The following are the bids opened on Jan. 23 by C. B. J. Snyder, Supt. School Bldgs. N. Y. City, for the gen- eral construction of School No. 151, o Knickerbocker Ave. and Halsey St.: Juan B. Arcl, \$201,750 (awarded contract); Rich- ard E. Heningham, \$205,423; Peter Cleary, \$221,200; Clarke & Stowe, \$214,300; Thos. Cockerill & Son, \$220,752; Guidone & Galardi, \$225,600; Geo. Hildebrand, \$206,900; Wm. Werner, \$219,753; Buckley Realty Constr. Co., \$216,593; Wm. P. McGarry, \$209,840; Chas. H. Peckworth, \$211,420; Fan- ning & Reilly, \$217,679; John Auer & Sons, \$213,340; Louis Wechsler, \$217,755, and F. J. Kelly's Sons, \$210,300. Jas. Harley, 288 Flatbush Ave., has secured the contract for plumbing same (bids opened Jan. 23), for \$1,472.

The following are the bids opened on Jan. 30 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for sanitary work and gas-fitting of additions to and alterations in Public School 110, Brooklyn Boro.: Jas. Fay, \$10,319; Wm. C. Ormond, \$9,871; Jas. Harley, \$10,838, and Chris. Nally, 2398 Bway., N. Y. City, \$9,551.

*Contracts have been awarded as follows (bids opened Jan. 30): Item 1, general con- struction; Item 2, heating 8 one-story class- room additions, Public Schools 84 and 125, and Item 3, general repairs, painting, etc., School 84, Brooklyn Boro., to Richard Staple- ton, \$18,310; Wm. Horne Co., 245 W. 26th St., N. Y. City, \$3,473, and Frank M. Walsh, 374 Hamilton Ave., \$2,579 respectively.

Bids will be received Feb. 14 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for erecting, including plumbing and drainage, School No. 68; also for sanitary work and gasfitting in School No. 147, Boro. Brooklyn.

Carthage, N. Y.—At the special town meet- ing held in West Carthage on Jan. 19 the citi- zens voted in favor of appropriating \$28,000 for the erection of a school. Eaton & Brownell, of Carthage, are the archts.

New Brighton, S. I., N. Y.—Bids will be received Feb. 14 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for erecting addi- tions to School No. 23, Boro. Richmond.

Gloversville, N. Y.—M. V. B. Stetson, City Clk., writes that the citizens voted Jan. 31 to issue \$100,000 bonds for the erection of a high school.

New Rochelle, N. Y.—Bids will be received Feb. 7 by Chas. Kammermeyer, City Clk., for \$17,500 school bonds.

Cleveland, O.—The Com. on School Bldgs. has directed plans prepared for a 12-room school to be erected on Tod St.

Cincinnati, O.—The members of St. Pat- rick's R. C. Church will erect a school at a cost of \$20,000. Rev. John Hickey, Pastor.

Grove City, Pa.—The Bd. of Trus. of the Grove City College have decided to erect a \$14,000 science hall.

Allegheny, Pa.—F. C. Sauer, Hamilton Bldg., Pittsburg, it is stated, has prepared plans for a 3-story brick manual training school to be erected in the 2d Ward, at an estimated cost of \$65,000.

Nashville, Tenn.—The main building of the Roger Williams Univ. for Negroes, it is re- ported, has been destroyed by fire. The Univ. is under the patronage of the Hoe Mis- sionary Society of N. Y. City.

The Peabody College for Teachers at the Univ. of Nashville, has been voted \$1,000,000 by the Trus. of the Peabody Bd. It is the intention of the Trus. of the College, accord- ing to reports, in the near future to erect buildings, to cost about \$250,000. Included in the plans are a library building, costing \$30,000; 2 dormitories, costing \$50,000 each; a science hall, costing \$30,000; a gymnasium, costing \$30,000; a laboratory, costing about \$40,000, and a chapel and society halls.

Clifton, Tenn.—A charter has been ap- plied for by J. J. Montague and others for the purpose of erecting a college in this city at a cost of \$10,000. It is to be known as the Frank Hughes College.

Johnson City, Tenn.—The Bd. of Educ. has petitioned for permission to erect a \$35,000 school.

Two Rivers, Wis.—Bids will be received Feb. 28 by the St. John's Lutheran Church for erecting a school. Address C. H. Tegen, Archt., Manitowoc.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Waterbury, Conn.—Bids will be received Feb. 20, by the Bd. Comrs. Pub. Health for removing garbage and offal for 1 year from Apr. 1, 1905, including collections and dis- posal of kitchen garbage, carcasses of dead animals by cremation, for burning refuse that may be brought to crematory for dis- posal, by private individuals, from stores, mar- kets, hotels, and for burning all solid collection of scavengers. Geo. H. Nettleton, City Clk.

New Haven, Conn.—Contracts for the re- moval of garbage for the year 1905 are stated to have been awarded on Jan. 18, as follows: Edw. W. Lovejoy, for the western section, \$4,000, and for Morrell & Hemmings, for the eastern section, \$3,190.

Jacksonville, Fla.—Local press reports state that at a meeting of the Bd. of Pub. Wks., Jan. 23, the offer of Judge A. O. Wright to install a garbage reducing plant, and oper- ate the same for 90 days without expense to the city, was accepted, and Judge Wright expects to have the plant installed very short- ly.

Boston, Mass.—Local press reports state that Supt. of Sts. Donovan, will recommend to Mayor Collins that two incinerating plants for the Street Dept. be constructed at a cost of \$50,000, to dispose of refuse matter which owners of garbage dumping grounds object to.

St. Louis, Mo.—An ordinance has been in- troduced in Council, providing for the equip- ment of a garbage system, at a cost not ex- ceeding \$65,000.

New York, N. Y.—Bids will be received Feb. 25 at Municipal T. Enclos. Ch. Bureau Yards and Docks, Navy Dept., Whitehall, D. C., for constructing a garbage incinerating plant at navy yard here.

Bids will be received by John Mc G. Wood- bury, Comr. Street Cleaning, on Feb. 15, for furnishing material and labor required to con- struct a rubbish incinerator at Delancey Slip, bet. Tompkins and East St., as advertised in The Engineering Record. This is one step toward the construction of a combined crem- atory and electric light plant the city is to build to light Williamsburg Bridge and public buildings in the vicinity. The Street Clean- ing Dept. has \$27,000 available for the incin- erator and the Bridge Dept. has \$60,000 for a machinery shop.

Ft. Worth, Tex.—The Ft. Worth Garbage Co. is stated to have presented to City Coun- cil an offer to construct a garbage plant, 3 miles southeast of city and dispose of all city garbage at \$1,000 per year.

Toronto, Ont.—The Sub-Committee of the Bd. of Wks. is reported to have recommended the construction of a garbage incinerator in the northwest portion of the city and Comr. Jones was requested to report before next meeting as to the cost, etc.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

Ravitch Bros., 81-89 Mangin St., New York, are about to erect a 75x90-ft. shop for structural iron work at 136th St., Madison Ave. and the Harlem River. The capacity of the power plant will be 50 h.p.

The Duncan, Ind. Ter., Light & Power Co. contemplates erecting a 10-ton ice plant. The building will be 62x70 ft. W. L. Bumpass, mgr.

Bernard Brown, gen. mgr., Texas Rice Mills, Houston, Tex., writes that the capacity of the company's power plant will be about 300 h.p. An 18x36-in. or 18x42-in. Corliss engine and water-tube boiler will probably be installed.

The J. V. Newlin Mfg. Co. Sebring, O., expects to erect a machine shop in connection with its foundry the coming spring, but details have not been decided.

The E. J. Hathaway Co., 213-217 Pearl St., Sioux City, Ia., dealers in butter, eggs and poultry, are erecting a 75x150-ft. cold-storage warehouse. A 100-h.p. boiler, ice machine, 25-kw. generator, etc., will be installed.

The Page Woven Wire Fence Co., Monessen, Pa., is erecting additional steel and brick buildings having about 50,000 sq. ft. floor space. The amount of power needed for the addition will probably not exceed 100 h.p., which will be furnished from the main plant.

The Indiana Drain Tile Co., Alexandria, Ind., proposes to erect a plant to cover about one acre. Two 100-h.p. boilers and one 150-h.p. engine will be installed.

The Lytle Construction Co., Sioux City, Ia., expects to erect a small planing mill. Probably the amount of power required will be 30 or 40 h.p.

The United States Hoe & Tool Co., 610 M. & M. Bank Bldg., Columbus, O., will erect a factory to include three or four 1 and 2-story buildings, covering about 100x500 ft. Arrangements for power plant have not yet been made.

The Clinton, S. C., Commission Co., P. O. Box 203, contemplates the erection of a canning plant.

The Morley Twine & Machinery Co., Lytle Block, Sioux City, Ia., will erect a plant to have a daily capacity of 20 tons twine. A power plant of about 500 h.p. will be required. The buildings will include a fiber warehouse for raw material, a warehouse for finished twine, main twine mill and office building, and will contain about 50,000 sq. ft. floor space. A Sturtevant hot-air heating system and an electric light plant will be installed.

The Davenport, Ia., Sugar Co. writes that the size of the plant it will erect depends on the acreage on sugar beets it can secure, but the plant will have a capacity of at least 500 tons. M. H. Mueller, secy.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

***Little Rock, Ark.**—The Dalhoff Constr. Co., of Little Rock, is stated to have secured the contract for constructing a levee 6 miles in length on the north side of Arkansas River; probable cost, \$25,000.

***San Francisco, Cal.**—Healy, Tibbets & Co., 22 Market St., are stated to have secured the contract for a longitudinal dike at the Navy Yard, Mare Island (bids opened Jan. 14), for \$92,300.

Washington, D. C.—Bids will be received Feb. 28, at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at the navy yards, Portsmouth, N. H., Boston, Mass., New York, N. Y., Washington, D. C., Norfolk, Va., and Pensacola, Fla., a quantity of machine tools, including engine lathe, centrifugal pumping sets, radial drill, planer, gear cutting machine, drilling machine, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Washington, D. C.—See "Public Buildings."

Warsaw, Ind.—Bids will be received Feb. 7, by the Bd. Co. Comrs., for constructing public ditch in Plain and Wayne Townships.

Greencastle, Ind.—It is reported that bids will be received until Feb. 20 for installing a passenger elevator in the court house. C. C. Hurst, Pres. Bd. Co. Comrs.

Indianapolis, Ind.—It is reported that contracts will probably soon be let by the Bd. of Pub. Wks., for the separation of grades at Massachusetts Ave.; the city will pay \$25,000 for its share of the work.

Contracts will probably soon be let by the County Comrs., for the construction of a brick smoke stack 150 ft. high.

Storm Lake, Ia.—Bids will be received by E. D. Hoxsey, Co. Aud., until Mar. 7 for constructing ditches in Drainage Dist. No. 1, the first section of which is 148x27 cu. yd., and the second section estimated at 47,274 cu. yd. L. A. Torkelson, Chmn. Bd. Suprv.

Shreveport, La.—Bonds to the amount of \$50,000 are reported to have been sold by the Bossier Levee Board.

New Orleans, La.—All bids opened on Dec. 6 by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the coal storage and coal handling plant at New Orleans, have been rejected. Specifications will be revised and work readvertised.

Boston, Mass.—See "Electric Railways."

***Worcester, Mass.**—The Smith-Green Co., of Worcester, is stated to have secured the contract for furnishing cement to be used by the Water, Sewer & Street Dept. (bids opened Jan. 23) at \$1.62 per bbl.

Weehawken, N. J.—See "Electric Railways."

***New York, N. Y.**—The following are the bids opened on Jan. 26 by the Dept. of Docks and Ferries for furnishing and delivering 10,000 bbls. of Portland cement (price given per bbl.): Atlas Portland Cement Co., 30 Broad St., \$1.35; Standard Material Co., 1 Bway., \$1.45; and John P. Kane Co., 287 4th Ave., \$1.27½ (awarded contract).

Bids will be received Feb. 9 by the Bd. Park Comrs., for furnishing material, repairing and strengthening dike along Cromwell's Creek water front of Macomb's Dam Park, Boro. Bronx. John J. Pallas, Chmn.

Ellis Island, N. Y.—Bids will be received until March 1 by the Com. of Immigration, Ellis Island, for constructing an island near Ellis Island, as advertised in The Engineering Record.

New York, N. Y.—See "Railroads."

New Rochelle, N. Y.—Bids will be received Feb. 7 by Chas. Kammermeyer, City Clk., for \$19,000 local improvement bonds.

Dayton, O.—Bids will be received Feb. 10 by the Bd. Pub. Service for laying conduits over new 3d St. River bridge. Wm. Miller, Clk.

Philadelphia, Pa.—Bids will be received Feb. 25 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Yard, Washington, D. C., for dredging about 65,000 cu. yds. material from reserve basin at navy yard here.

Beaumont, Tex.—Press reports state that Capt. Jas. F. McIndoe, Corps Engrs., U. S. A., 3232 Prytanla St., New Orleans, La., has completed and forwarded to Washington, D. C., plans and specifications for a channel along the west shore of Sabine Lake, in the vicinity of Beaumont and Orange. As soon as the plans are approved contracts will be let.

***Norfolk, Va.**—The Coastwise Dredging Co., of Norfolk, is stated to have secured the contract for dredging Norfolk Harbor, 400,000 cu. yds. (bids opened Jan. 9) at 7.7 cts. per cu. yd.

Bermuda.—Bids will be received by the Crown Agents for the Colonies, Whitehall Gardens, London, S. W., England, on behalf of the Government of Bermuda, until Apr. 10, for deepening, widening and buoying St. George's Channel. A plan, drawing, form of contract, etc., may be seen at the office of the British Consul-General, 17 State St., N. Y. City, between the hours of 11 A. M. and 3 P. M. On the payment of \$20 two copies of the form of tender and the form of contract may be received, and the bidder allowed to make copies of the plan, drawings and sections showing the work to be executed under the contract. The \$20 to be returned to the bidder submitting bona fide bid properly completed.

Dover, Ont.—See "Bridges."

Panama.—Bids will be received Feb. 15 by the Isthmian Canal Comn., Washington, D. C. (J. G. Walker, Chmn.), for furnishing 2 stone crushers of the gratory type, both to be similar or equal in size and capacity to No. 8 and No. 5 Gates crusher, respectively.

PROPOSALS OPEN.

For proposals see pages 30, 31, 33, 34.

Bids Close.	WATER WORKS.	See Eng. Record.
Feb. 6.	Pump, etc., Jacksonville, Fla.	Jan. 14
Feb. 7.	Ellisville, Miss.	Jan. 21
Feb. 7.	Christman, Ill.	Adv. Jan. 21
Feb. 8.	Pipe, South Bend, Ind.	Jan. 14
Feb. 9.	Ft. Keogh, Mont.	Jan. 21
Feb. 10.	Bishop, Cal.	Dec. 10
Feb. 11.	Main, Norwood, O.	Jan. 21
Feb. 13.	Boller, Asbury Park, N. J.	Jan. 28
Feb. 18.	Boilers, etc., Norwood, O.	Jan. 28
Feb. 20.	Specials, Washington, D. C.	Feb. 4
Feb. 22.	Schoharie, N. Y.	Jan. 28
Feb. 23.	Mains, Ft. Preble, Me.	Feb. 4
Feb. 23.	Tillamook, Ore.	Jan. 14
Mar. 1.	Charton, Ia.	Jan. 28
Mar. 4.	Meeker, Colo.	Feb. 4
Mar. 8.	Filtration, Pittsburg, Pa.	Jan. 28
Mar. 21.	Well, Ft. Caswell, N. C.	Feb. 4
Mar. 31.	Meters, Pocatello, Idaho.	Jan. 28
Mar. —.	Smith's Grove, Ky.	Jan. 7
Apr. 1.	Irrig., Usk, Wash.	Dec. 24

SEWERAGE AND SEWAGE DISPOSAL.

Feb. 6.	Jersey City, N. J.	Feb. 4
Feb. 6.	Washington, D. C.	Jan. 14
Feb. 7.	Mamaronck, N. Y.	Feb. 4
Feb. 7.	Los Angeles, Cal.	Jan. 7
Feb. 10.	Bishop, Cal.	Dec. 10
Feb. 14.	Cleveland, O.	Feb. 4
Feb. 14.	St. Louis, Mo.	Feb. 4
Feb. 14.	Copeland, N. Y.	Jan. 28
Feb. 15.	Havana, Ill.	Jan. 14
Feb. 15.	Marion, O.	Feb. 4
Feb. 15.	Lincoln, N. S.	Jan. 14
Feb. 16.	Sullivan, Ind.	Feb. 4
Feb. 16.	St. Bernard, O.	Jan. 21
Feb. 23.	New Rochelle, N. Y.	Jan. 28
Feb. 24.	Wilkesbarre, Pa.	Feb. 4

BRIDGES.

Feb. 7.	Indianapolis, Ind.	Jan. 21
Feb. 7.	Binghamton, N. Y.	Jan. 21
Feb. 7.	Stockton, Cal.	Jan. 21
Feb. 7.	Muscataine, Ia.	Jan. 14

Feb. 7.	Wabash, Ind.	Jan. 14
Feb. 8.	Patchogue, L. I., N. Y.	Jan. 28
Feb. 8.	Vincennes, Ind.	Jan. 21
Feb. 8.	Stevens Point, Wis.	Feb. 4
Feb. 9.	New York, N. Y.	Jan. 28
Feb. 13.	Sherbrook, N. D.	Jan. 21
Feb. 14.	Madison, Neb.	Feb. 4
Feb. 14.	Napa, Cal.	Dec. 31
Feb. 15.	Saginaw, Mich.	Feb. 4
Feb. 16.	Columbus, O.	Jan. 21
Feb. 16.	Charleston, W. Va.	Jan. 21
Feb. 17.	Port Clinton, O.	Jan. 21
Feb. 18.	Cincinnati, O.	Jan. 28
Feb. 20.	Cumpeper, Va.	Jan. 28
Feb. 20.	Yorik, Neb.	Jan. 28
Feb. 21.	Celina, O.	Feb. 4
Feb. 21.	Kearney, Neb.	Feb. 4
Feb. 23.	Dover, Ont.	Feb. 4
Mar. 1.	South Bend, Ind.	Jan. 28
Mar. 6.	San Jose, Cal.	Feb. 4

PAVING AND ROADMAKING.

Feb. 6.	Jersey City, N. J.	Feb. 4
Feb. 6.	Webb City, Mo.	Adv. Jan. 7
Feb. 7.	Ingram, Pa.	Feb. 4
Feb. 7.	New York, N. Y.	Jan. 28
Feb. 7.	Broad Ripple, Ind.	Jan. 21
Feb. 7.	Franklin, Ind.	Jan. 21
Feb. 7.	Rensselaer, Ind.	Dec. 31
Feb. 8.	Pleasantville, N. J.	Feb. 4
Feb. 8.	Mt. Alleed, O.	Jan. 28
Feb. 8.	Cincinnati, O.	Feb. 4
Feb. 8.	Cleveland, O.	Jan. 28
Feb. 9.	Buffalo, N. Y.	Feb. 4
Feb. 9.	Port Townsend, Wash.	Jan. 21
Feb. 10.	Dayton, O.	Feb. 4
Feb. 10.	Savannah, Ga.	Feb. 4
Feb. 10.	Indianapolis, Ind.	Jan. 28
Feb. 13.	Kalamazoo, Mich.	Feb. 4
Feb. 13.	Jacksonville, Fla.	Jan. 28
Feb. 14.	New York, N. Y.	Feb. 4
Feb. 14.	St. Louis, Mo.	Feb. 4
Feb. 14.	Napa, Cal.	Dec. 31
Feb. 15.	Meadville, Pa.	Feb. 4
Feb. 15.	Toledo, O.	Feb. 4
Feb. 15.	Cornwall, Conn.	Jan. 28
Feb. 15.	Leesville, La.	Jan. 28
Feb. 15.	Madison, Wis.	Jan. 21
Feb. 16.	Des Moines, Ia.	Feb. 4
Feb. 18.	Washington, D. C.	Jan. 21
Feb. 20.	Flint, Mich.	Feb. 4
Feb. 21.	New York, N. Y.	Feb. 4
Feb. 23.	Cincinnati, O.	Feb. 4
Feb. 24.	Cincinnati, O.	Feb. 4
Feb. 24.	York, Pa.	Feb. 4
Feb. 25.	Celina, O.	Feb. 4
Feb. 27.	Wilkesbarre, Pa.	Feb. 4
Feb. 27.	Hartford, Conn.	Jan. 28
Feb. 27.	Dayton, N. Y.	Feb. 4
Mar. 1.	Grass Valley, Cal.	Jan. 28

POWER, GAS AND ELECTRICITY.

Feb. 7.	Trenton, N. J.	Feb. 4
Feb. 7.	Ft. Des Moines, Ia.	Jan. 28
Feb. 10.	Ft. Leavenworth, Kan.	Jan. 28
Feb. 14.	St. Louis, Mo.	Feb. 4
Feb. 14.	New York, N. Y.	Feb. 4
Feb. 14.	Eureka, Cal.	Jan. 28
Feb. 15.	West Point, N. Y.	Jan. 28
Feb. 15.	Governor's Island, N. Y.	Jan. 28
Feb. 15.	Cleveland, O.	Jan. 21
Feb. 15.	Temple, Tex.	Jan. 21
Feb. 15.	Chicago, Ill.	Dec. 24
Apr. —.	Ft. Valley, Ga.	Jan. 21
Apr. —.	Laconia, N. H.	Jan. 28

BUILDINGS.

Feb. 6.	School, Brooklyn, N. Y.	Jan. 28
Feb. 6.	School, New York, N. Y.	Jan. 28
Feb. 6.	Schools, New Brighton, S. I., N. Y.	Jan. 28
Feb. 6.	Htg. Post Bldg., Ft. Mott, N. J.	Adv. Jan. 14 to 28
Feb. 7.	Court House, Hillsboro, N. D.	Jan. 21
Feb. 7.	Armory, Flushing, N. Y.	Jan. 21
Feb. 7.	Adv. Jan. 21 to Feb. 4.	
Feb. 7.	School, Philadelphia, Pa.	Jan. 21
Feb. 7.	Court House, Monticello, Miss.	Jan. 21
Feb. 7.	School, Lac du Flambeau, Wis.	Jan. 14
Feb. 7.	P. O. Bldg., Nevada, Mo.	Dec. 31
Feb. 8.	School, Baltimore, Md.	Jan. 28
Feb. 8.	School, Valdosta, Ga.	Jan. 28
Feb. 8.	Hub Bldg., Ft. Slocum, N. Y.	Jan. 28
Feb. 8.	Classic Temple, Watertown, Wis.	Jan. 21
Feb. 8.	School, Bolivar, N. Y.	Jan. 14
Feb. 8.	School, Halstad, Minn.	Jan. 14
Feb. 9.	Jail, New Albany, Miss.	Jan. 21
Feb. 9.	Post Bldg., Plattsburg, N. Y.	Jan. 14
Feb. 9.	Adv. Jan. 14 to Feb. 4.	
Feb. 9.	Post Bldg., Tonkville, S. I., N. Y.	Jan. 14 to 21
Feb. 9.	P. O. Bldg., Natchez, Miss.	Jan. 7
Feb. 10.	Y. M. C. A. Bldg., Douglas, Ariz.	Feb. 4
Feb. 10.	School plans, New Haven, Conn.	Feb. 4
Feb. 10.	School, Springfield, Mass.	Jan. 28
Feb. 10.	School, Alva, Okla.	Jan. 28
Feb. 10.	School, Helena, Okla.	Jan. 21
Feb. 10.	Post Bldg., Ft. Howard, Md.	Jan. 21
Feb. 11.	Post Bldg., Chickamauga Park, Ga.	Adv. Jan. 21 to Feb. 4
Feb. 13.	Htg., etc., Museums, Philadelphia, Pa.	Feb. 4
Feb. 13.	Post Bldgs., Point Bonita, Cal.	Jan. 21
Feb. 13.	Adv. Jan. 21 to Feb. 4.	
Feb. 13.	Court House, Clinton, Minn.	Jan. 21
Feb. 14.	School, Albemarle, N. C.	Jan. 21
Feb. 14.	School, New Brighton, S. I., N. Y.	Feb. 4
Feb. 14.	School, Brooklyn, N. Y.	Feb. 4
Feb. 14.	School, New York, N. Y.	Feb. 4
Feb. 14.	School, Orange, N. J.	Jan. 28
Feb. 14.	Armory, Binghamton, N. Y.	Jan. 21
Feb. 14.	Adv. Jan. 21 to Feb. 4.	
Feb. 14.	Htg. O. Bldg., Batesville, Ark.	Adv. Jan. 14 to 21
Feb. 15.	Pub. Bldg., Brooklyn, N. Y.	Feb. 4
Feb. 16.	Post Bldgs., Ft. Harrison, Mont.	Feb. 4
Feb. 15.	School, Staunton, Va.	Jan. 28
Feb. 15.	Memorial Bldg., Cincinnati, O.	Jan. 28
Feb. 15.	Post Bldg., Ft. Wright, Wash.	Jan. 21

Feb. 15.	School, Talklal, Ariz.	Jan. 21
Feb. 15.	Church, Flaudreau, S. D.	Jan. 21
Feb. 15.	Htg. P. O. Chillicothe, O.	Jan. 14
Feb. 20.	Hospital, Albany, N. Y.	Feb. 4
Feb. 21.	Htg. Guard House, Ft. Assiniboine, Mont.	Jan. 28
Feb. 21.	Univ. Bldg., Washington, D. C.	Jan. 21
Feb. 21.	P. O. Bldg., Westchester, Pa.	Dec. 31
Feb. 23.	Sashes, etc., War College, Washington, D. C.	Adv. Jan. 28
Feb. 23.	Court House, Ellsworth, Wis.	Jan. 28
Feb. 23.	P. O. Bldg., Decatur, Ill.	Jan. 14
Feb. 25.	Htg. P. O. Bldg., Anniston, Ala.	Feb. 4
Feb. 27.	Post Bldg., Ft. Caswell, N. C.	Feb. 4
Feb. 27.	Post Bldg., Ft. Morgan, Ala.	Jan. 28
Feb. 27.	P. O. Bldg., Columbia, Mo.	Feb. 4
Feb. 28.	School, Two Rivers, Wis.	Jan. 28
Feb. 28.	P. O. Bldg., Louisiana, Mo.	Jan. 28
Mar. 1.	Htg. P. O. Bldg., Hastings, Neb.	Feb. 4
Mar. 1.	Court House, Edna, Tex.	Feb. 4
Mar. 1.	Htg., etc., Post Bldg., Chickamauga Park, Ga.	Feb. 4
Mar. 2.	P. O. Bldg., Adrian, Mich.	Jan. 28
Mar. 6.	U. S. Soldiers' Home, Washington, D. C.	Adv. Feb. 4
Mar. 6.	Court House, Greenwood, Miss.	Jan. 28
Mar. 6.	P. O. Bldg., Battle Creek, Mich.	Adv. Jan. 21, 28
Mar. 6.	Court House, Sardis, Miss.	Dec. 17
Mar. 7.	P. O. Bldg., Findlay, O.	Jan. 21
Mar. 8.	P. O. Bldg., Muskegon, Mich.	Jan. 28
Mar. 11.	Court House, Magnolia, Ark.	Feb. 4
Mar. 13.	P. O. Bldg., Hammond, Ind.	Jan. 28
Mar. 14.	P. O. Bldg., Moberly, Mo.	Jan. 28
Mar. 15.	Jail, Camden, N. J.	Feb. 4
Mar. 20.	P. O. Bldg., Elizabeth City, N. C.	Adv. Feb. 4
Mar. 21.	P. O. Bldg., Laredo, Tex.	Feb. 4
Mar. 23.	P. O. Bldg., Sherman, Tex.	Feb. 4
Mar. —.	School, Klamath Falls, Ore.	Jan. 28
Apr. 1.	Y. M. C. A. plans, Binghamton, N. Y.	Feb. 4
Apr. 5.	Court House plans, New Orleans, La.	Dec. 3
Apr. —.	School Bldg. material, etc., Phoenix, Ariz.	Feb. 4

MISCELLANEOUS.

Feb. 6.	Garb. Disp., Albany, N. Y.	Jan. 28
Feb. 7.	Ditch, Warsaw, Ind.	Feb. 4
Feb. 7.	Wharf, New Orleans, La.	Jan. 28
Feb. 7.	Hydraulic Dredge, Toronto, Ont.	Jan. 28
Feb. 7.	Supplies, Washington, D. C.	Jan. 21
Feb. 7.	Tools, Machry, etc., Panama	Jan. 21
Feb. 7.	Adv. Jan. 14 to Feb. 4.	
Feb. 7.	Supplies, Philadelphia, Pa.	Jan. 14
Feb. 7.	Wharf, Ft. Totten, Willets Point, N. Y.	Jan. 14
Feb. 7.	Adv. Jan. 14 to Feb. 4.	
Feb. 7.	Bldg. supplies, Chicago, Ill.	Jan. 14
Feb. 8.	Dam, etc., Phoenix, Ariz.	Dec. 24
Feb. 9.	Adv. Dec. 3 to 24.	
Feb. 9.	Repairing dike, New York,N.Y.	Feb. 4
Feb. 10.	Conduits, Dayton, O.	Feb. 4
Feb. 11.	Canal work, Panama, O.	Jan. 21
Feb. 11.	Adv. Jan. 14 to Feb. 4.	
Feb. 11.	Tile work, Pana, Ill.	Jan. 21
Feb. 11.	Electric Elevator, Portsmouth, N. H.	Jan. 21
Feb. 11.	Crane runways, Boston, Mass.	Jan. 21
Feb. 11.	Supplies, Washington, D. C.	Jan. 21
Feb. 13.	Garbage, Atlantic City, N. J.	Jan. 28
Feb. 14.	Tunnel, Boston, Mass.	Feb. 4
Feb. 15.	Garb. Incinerator, New York, N. Y., Adv. Feb. 4.	Feb. 4
Feb. 15.	Stone crusher, Panama	Feb. 4
Feb. 15.	El. Ry. franchise, Eureka, Cal.	Feb. 4
Feb. 15.	Steam pump,Ft. McKinley Me.	Jan. 21
Feb. 15.	Adv. Jan. 21 and 28.	
Feb. 15.	Dredging, Chicago, Ill.	Jan. 21
Feb. 15.	Adv. Jan. 14 to Feb. 4.	
Feb. 16.	Wharf, San Francisco, Cal.	Jan. 28
Feb. 16.	Garbage, Chicago, Ill.	Jan. 21
Feb. 16.	Adv. Jan. 21 to Feb. 4.	
Feb. 16.	Dredging, Detroit, Mich.	Jan. 21
Feb. 16.	Adv. Jan. 14 to Feb. 4.	
Feb. 17.	Drainage, Ft. Andrews, Ped-docks Island, Mass.	Jan. 28
Feb. 17.	Embkmt work, San Francisco, Cal.	Jan. 28
Feb. 18.	Adv. Jan. 28 to Feb. 4.	
Feb. 18.	Channel work, etc., New Or-leans, La.	Jan. 28
Feb. 18.	Adv. Jan. 28 to Feb. 4.	
Feb. 18.	Crushed stone, Cincinnati, O.	Jan. 28
Feb. 18.	Drain Pipe, Cincinnati, O.	Jan. 28
Feb. 20.	Elevator, Green Castle, Ind.	Feb. 4
Feb. 20.	Garb. Disp., Waterbury, Conn.	Feb. 4
Feb. 21.	Machine tools, Washington, D. C.	Jan. 28
Feb. 21.	Cement, Fernbank, O.	Jan. 21
Feb. 21.	Adv. Jan. 21 to Feb. 4.	
Feb. 23.	Cement, etc., Newport, R. I.	Jan. 28
Feb. 23.	Adv. Jan. 28 to Feb. 4.	
Feb. 23.	El. Ry. franchise, San Diego, Cal.	Jan. 21
Feb. 25.	Dredging, Philadelphia, Pa.	Feb. 4
Feb. 25.	Garb. Disp., New York, N. Y.	Feb. 4
Feb. 25.	Lock work, Panama, O.	Jan. 21
Feb. 27.	(2d. Prop.) Adv. Jan. 28, Feb. 4 and 28.	
Feb. 27.	El. Ry. franchise, Stockton, Cal.	Jan. 28
Feb. 28.	Machine tools, Washington, D. C.	Feb. 4
Mar. 1.	Island, Ellis Island, N. Y.	Feb. 4
Mar. 6.	Adv. Feb. 4.	
Mar. 6.	R. Tunnel, New York, N. Y.	Feb. 4
Mar. 6.	Drainage work, Nebraska City, Neb.	Jan. 28
Mar. 7.	Ditches, Storm Lake, Ia.	Feb. 4
Mar. 15.	Dam, etc., Los Angeles, Cal.	Jan. 14
Mar. 17.	Adv. Jan. 21 to Feb. 4.	
Mar. 17.	Dredge, etc., St. Louis, Mo.	Jan. 21
Mar. 31.	Adv. Jan. 21 to Feb. 4.	
Apr. 10.	El. Ry. Shanghai, China.	Oct. 22
Apr. 10.	Channel work, Bermuda.	Feb. 4
Apr. 10.	El. Ry. franchise, Yazoo City, Miss.	Feb. 4